EFFICIENCY AND PRODUCTIVITY IN THE TAKAFUL AND INSURANCE INDUSTRIES IN PAKISTAN: A COMPARITIVE ANALYSIS

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by

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ABSTRACT

The comparisons of the efficiency insurance and takaful firms which are operating simultaneously in the financial system need further investigation. The takaful industry is new player in the market which is struggling on its profitability specifically for developing country like Pakistan. This study investigates the existence of technical efficiency (TE), pure technical efficiency (PTE) and scale efficiency (SE) by applying Data Envelopment analysis (DEA) for the insurance and *takaful* sector from 2008 to 2016. This study measures the productivity change with Malmquist productivity index (MPI) for both insurance and *takaful* sector. In addition, this study also aims to identify the firm level attributes (asset size (SIZE), market share (MS), profitability (ROE) and leverage (LEV)) by Tobit Regression which determine the efficiency of insurance and *takaful* industry for Pakistan. The data for the fourteen insurance and four *takaful* firms is collected from the annual reports of the firms, State Bank of Pakistan reports and Insurance Association of Pakistan reports. The results highlight that *takaful* firms have more technical and pure technical efficiency as compared to the insurance firms whereas insurance firms attain more scale efficiency score for the study period. The *takaful* industry records the higher productivity than insurance firms measured by MPI. The results show the negative significant relation between SIZE and TE, SE of insurance and PTE of *takaful* and positive with TE and SE of *takaful*. MS is positive and significant with TE, PTE and SE of insurance and PTE of *takaful*. ROE is negative and significant with PTE of insurance and TE and SE of *takaful*. LEV is significant except to SE of insurance. The mixed results imply that policy makers and practitioners should develop different prudential regulations to improve scale efficiency especially for *takaful* industry by enhancing their branch network, new products development for adaptation of latest techniques and technology.

Keywords: efficiency, insurance, *takaful*, productivity, tobit

ABSTRAK

Perbandingan kecekapan antara firma-firma insuran dan takaful yang beroperasi selari di dalam sistem kewangan memerlukan kajian lanjutan. Industri takaful merupakan pemain baru dalam pasaran dimana sedang berusaha terhadap keuntungan mereka. Kajian ini mengkaji kewujudan kecekapan teknikal (TE), kecekapan teknikal asli (PTE), dan skala kecekapan (SE) dengan mengaplikasikan Analisis Pembangunan Data (DEA) terhadap sektor insuran dan takaful dari tahun 2008 hingga 2016. Penyelidikan ini mengukur perubahan produktiviti dengan menggunakan index produktiviti Malmquist (MPI) bagi kedua-dua sektor insuran dan takaful. Di samping itu, objektif kajian ini juga mengenalpasti ciri-ciri firma [saiz aset, (SIZE), pasaran saham (MS), keuntungan (ROE), peminjaman (LEV)] dengan menggunakan regrasi Tobit (TB) untuk menentukan keberkesanan industri insuran dan takaful di Pakistan. Data untuk empat belas buah firma insuran dan empat buah firma takaful dikumpul daripada laporan tahunan firma, laporan bank Pakistan dan laporan persatuan insuran Pakistan. Keputusan kajian ini menyatakan bahawa firma-firma takaful mempunyai lebih kecekapan teknikal dan kecekapan teknikal asli berbanding firma-firma insuran manakala firma –firma insuran memperoleh lebih skor skala kecekapan di dalam tempoh kajian. Takaful industri merekodkan produktiviti yang tinggi berbanding firma – firma insuran melalui ukuran MPI. Dapatan ini menunjukkan hubungan negatif serta signifikan antara SIZE dan TE, insuran SE serta takaful PTE, dan hubungan positive pula antara takaful TE dan SE. Hubungan antara MS dan TE, PTE, insuran SE serta takaful PTE adalah positif dan signifikan. ROE pula berhubung secara negatif dan signifikan dengan insuran PTE, TE dan takaful SE. LEV pula tidak signifikan kecuali terhadap insuran SE. Kepelbagaian hasil dapatan kajian ini menunjukkan bahawa pembuat polisi dan pengamal industri wajar membangunkan pengawalseliaan berhemat untuk memperbaiki kecekapan skala terutamanya dalam industi takaful dengan mengukuhkan jaringan cawangan - cawangan dan pembangunan produk baru dengan mengadaptasikan teknik dan teknologi terkini.

Kata kunci: Keberkesanan, insuran, takaful, produktiviti, tobit

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LIST OF ABBREVIATION

SBP	State Bank of Pakistan
SECP	Securities Corporation of Pakistan
AAOIFI	Accounting and Auditing Organization for Islamic Financial Institutions
IAP	Insurance Association of Pakistan
IFD	Islamic Finance Department
CAGR	Compound Annual Growth Rate
ROA	return on asset
ROE	ratio and return on equity
DEA	Data Envelopment Analysis
SFA	Stochastic frontier Approach
TE	Technical Efficiency
PTE	Pure Technical Efficiency
SE	Scale Efficiency
MPI	Mahnquist productivity index
TFP	Total Factor Productivity
CRS	Constant Return to Scale
VRS	Variable Return to Scale
IRS	Increasing Return to Scale
DRS	Decreasing Return to Scale

CHAPTER ONE

INTRODUCTION

1.1 Introduction

This study is on the insurance and *takaful* industries of the Pakistan whereby insurance and *takaful* firms are financial intermediaries which have undergone several structural changes. The insurance industry of Pakistan for instance, has gone through four different stages of development after the independence of Pakistan. The first stage started in 1948 with the establishment of department of insurance under the Ministry of Commerce and some amendments in 1958 within the Insurance Act of 1938. The second stage was the Nationalization Act, 1970 when all the insurance firms were taken under the control of the Government and merged into one State Life Insurance Corporation. The third stage, when the government started the privatization process in 1992 (Securities and Exchange Commission of Pakistan, 2000; State Bank of Pakistan, 2005) and the fourth stage involved post consolidation of the insurance industry which started in 2006 (Malik, Malik, & Faridi, 2011). The structural changes in the insurance industry are intended to improve the efficiency of the financial system in Pakistan. The efficiency measurement is the tool to establish the impact of reforms and direction of the stability of the insurance industry (Lee & Lin, 2016).

A strong and developed financial system in global business environment is viewed as indispensable for the economic development of any country. In particular, an evolved and well-functioning insurance industry is imperious for national wealth, economic growth in order to circulate funds efficiently through economic objects (Charumathi, 2012; Prasad, 2010). The role of the insurance industry is always vital particularly in

developing countries to create economies of scale, utilize the resources optimally, maintain liquidity and reduce financial risks (Haiss & Sümegi, 2008; Khan, 2018).

Pakistan is a populous Muslim country operating both insurance and *takaful* industry in which insurance and takaful companies are operating simultaneously. The Government of Pakistan has made improvements by taking positive steps in introducing Insurance Ordinance 2000, increasing paid up capital of insurance and takaful companies, *Takaful* Act, 2005 and implementing regulatory control of the industry (Malik, 2011).

In contrast to the mature stage and steady growth of the insurance industry in Pakistan, *takaful* industry is in its infancy period, and it is facing some serious issues including negative profitability, smaller market penetration, lower size of assets, and lack of analysis on its efficiency. The study on efficiency of Insurance and Takaful industry is justified as opined by Shah, Javeria, & Masood, (2018) that the efficiency measurement of the industry can establish the impact of those reforms within the social and financial infrastructure of Pakistan (Shah, Javeria, & Masood, 2018).

Therefore, it is critical to examine the relationship of efficiency and productivity of Insurance and Takaful industry and to establish its relationship with key financial factors such as, Asset Size, Market Share, profitability and leverage. Since these factors exhibit different results for different regions, due to the dissimilarity in practices, operations and government control, a study of the comparison between insurance and takaful companies is expected to contribute new findings and greater understanding of the industry in developing economies like Pakistan.

1.2 Background of Study

Insurance companies have two-fold roles for the growth and effective functioning of the economy. Insurance companies, on the one hand, facilitate perilous businesses through relocating the risks from insured to insurer. On the other hand, insurance companies act as financial intermediaries which minimize the transaction costs by gathering the savers and borrowers. Furthermore, insurance companies also help the capital market through its intermediation role as one of the major institutional investors. Therefore, the insurance companies are significantly important as financial institutions not only for individuals and businesses but also for the overall economy (Asghar & Afza, 2010; Lee, Chong, Sia, & Cheng, 2017).

Efficiency of insurance sector is often described by the input output equation since efficient firms can obtain higher performance by producing maximum output with lesser utilization of inputs. Different types of efficiency address the different information regarding the performance of insurance sector. For instance, Technical efficiency estimates the ability of a firm to minimize its input to attain the given output or maximum output with the specified input. Technical efficiency is also denoted as the operating efficiency of the firm. Whilst the allocative efficiency measures the right combination of inputs in the light of the their prices to produce maximum outputs (Biener, Eling, & Wirfs, 2016).

1.2.1 Insurance Sector of Pakistan

The insurance industry in Pakistan is as old as the independence of the country. Insurance firms were operating their business in the subcontinent even before partition.

However, before partition, this sector was not well matured and at that time, it was passing through its transitional stage. Pakistan became independent in 1947 and at that time, there were 84 insurance companies were in operation including 77 foreign and 7 domestic companies. However, the market was dominated by foreign companies and due to this reason, the contribution of indigenous companies was very limited (Malik et al., 2011).

In 1972, the insurance sector of Pakistan was nationalized and merged into a state-owned company named as "State Life of Pakistan". However, there was a major breakthrough in 1990s where the financial reforms took into place and these reforms allowed private and foreign companies to establish their business in the insurance sector (State Bank of Pakistan, 2005). Subsequently, in august 1999, Government of Pakistan announced an ordinance named "Insurance Ordinance 2000" which accelerated the business of this sector ("Securities and Exchange Commission of Pakistan 2000,").

1.2.2 *Takaful* Emergence and its Existence in Pakistan

By constitution, Pakistan is an Islamic state and 97% of the population is Muslim. Muslim/*shari'ah* scholars have some their own reservations regarding the nature and functions of the conventional insurance business. Majority of the *shari'ah* scholars believe that conventional insurance does not follow the major principles of Islamic jurisprudence, i.e. the conventional insurance activities are based on *riba* (interest), *Maysir* (gambling) and *Gharar* (uncertainty) (Ahmed, Ahmed, & Usman, 2011; Ali, 2016) and because of this phenomenon the insurance sector failed to attract the potential clients/investors in the Muslim societies (Khan, 2005). Due to quite a number

of efforts of Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI), the outcome of the research and discussions of the academicians and practitioners, in resultantly *shari'ah* scholars approved the Islamic alternative to conventional insurance known as *takaful* (Millar & Anwar, 2009; Swartz & Coetzer, 2010).

Ayub (2003) defines *takaful* as an alternative to insurance based on the Islamic concept of cooperation, social harmony and mutual indemnification of losses of fellows. It is a legal contract among the group of people agreed to indemnify the losses inflict upon them, from the collective fund they donated.

The concept of cooperative risk sharing is the oldest form of insurance, however the term and concept of *takaful* was first introduced in Sudan in 1979 and later on adopted by other Muslim countries like Saudi Arabia, Malaysia, Pakistan, Iran and then rest of the world. Currently, *takaful* is operating its business almost all over the world (in approximately more than 22 countries) and expanding its presence to the other regions of the world (Qureshi, 2011). Over the years, the system which was started as community-based initiative, developed as a profitable business, and become a significant part of the Islamic financial industry. The *takaful* industry is predicted to achieve USD 25.5 billion over the world in term of gross input by 2020 ("Global Islamic Finance Report ", 2016).

Majma-al-*Fiqh*, the Grand Council of Islamic Scholars, Saudi Arabia, approved *takaful* as an alternate to insurance according to the *shari'ah* ruling in 1985 (Ahmad, Masood, & Khan, 2010). The Council of Islamic Ideology in Pakistan reviewed the practice of *takaful* and alter it for the Pakistan's financial sector according to the *shari'ah* rulings.

And finally, after continuous efforts of seven years, on 29th April 1992, the members unanimously approved its recommendations in its report on Islamic System of Insurance (*Islami Nizam-e-Beema).* Moreover, the Council proposed and developed its own takaful structure (Wakalah model with waqf fund) instead of adapting any current and prevailing structure of *takaful* operations in other countries. The recommendations of the Council was presented to the government of Pakistan for its approval on 4th June, 1992 (Khan, 2016).

It is interesting to note that it took thirteen (13) years to implement the recommendation of the Council and then the Government of Pakistan issued "*Takaful* Rules 2005" on 3rd September 2005, an Islamic compatible *takaful* operational model. Following the proposed model of *takaful*, the *takaful* industry was established and subsequently three general and two family *takaful* firms started their operations in Pakistan, i.e. *Takaful* Pakistan Ltd, Pak Qatar General *Takaful* Ltd, Pak-Kuwait *Takaful* Ltd, Pak Qatar Family *Takaful* Ltd and Dawood Family *Takaful* Ltd ("Securities and Exchange Commission of Pakistan 2016,"). However, in 2015, Pak-Kuwait *Takaful* Ltd. closed its operation in Pakistan whereas the remaining four full-fledged *takaful* companies are still operating their business in Pakistan. It attracts new clients because of its *shari'ah* compliance. Because of its *shari'ah* compliant products, *takaful* model is acceptable to the majority of the population and exhibited a significant growth in its premium and asset structure. Therefore it attracts a larger number of new clients (Khan & Akhter, 2017).

1.2.3 Financial Analysis and Issues in Insurance/*Takaful* Industry of Pakistan

Pakistan is the seventh populous country in the world with a Muslim majority and Islamic philosophy as the theoretical context of the country's constitution. The appraised population of Pakistan is 183 million approximately of which 97% people are Muslims (Deloitte, 2014). This makes it a very abundant country for *takaful* industry. However, the *takaful* business is still in formative stage in the country and is expected to grow by 15- 20% in the next ten years (Kaunain & Akhtar, 2016).

This section presents the comparative analysis of the financial position with respect to growth, profitability, and management of the *takaful* and insurance industry of Pakistan for the period of 2008-2016. The growth of assets for *takaful* industry is depicted in Figure 1.1 for the study period which shows an increasing trend.

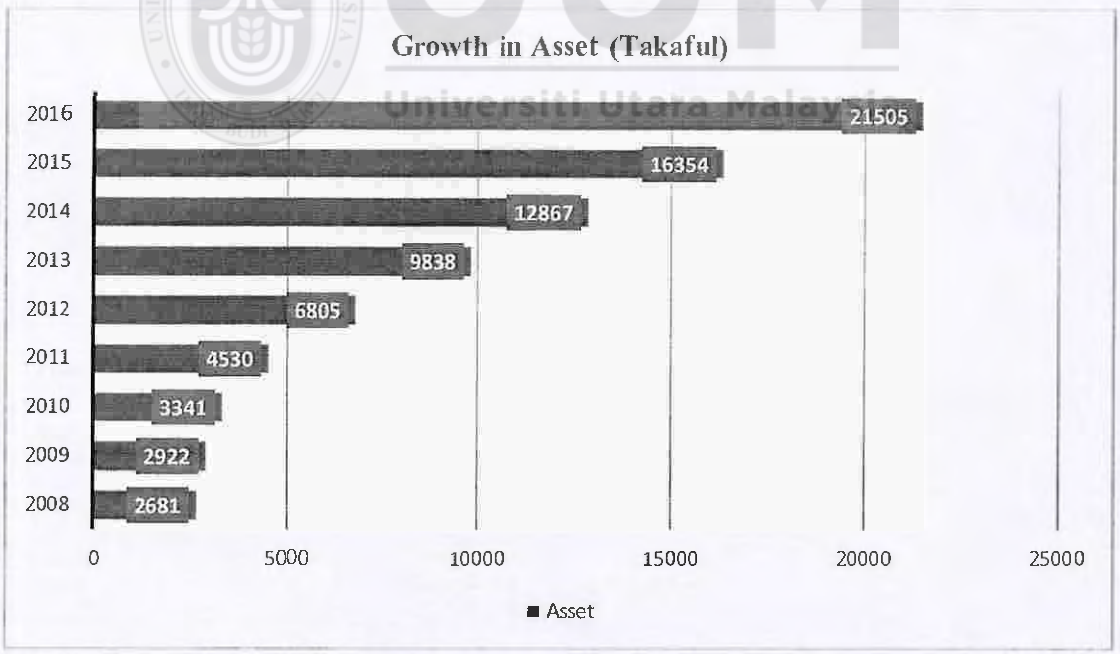


Figure 1.1
growth in asset of takaful industry over the period of 2008-2016

The figure reflects that the assets of *takaful* sector were almost double in three years (2009-11) and were seven times greater in 2016 than those in 2008. Table 1.1 presents

the asset growth rates (in annual percentages) of *Takaful* and insurance industry. There is a momentous difference between insurance and *takaful* sector from 2010 onwards. Although, both sectors were showing increasing trend but the rate of change in *takaful* sector is quite higher than of the insurance sector for the specified period.

Table 1.1
comparison of growth rate in Asset between Takaful and Insurance firms from 2008-2016

Year	Growth Rate in Asset (*Takaful*)	Growth Rate in Asset (Insurance)
2008	8%	12%
2009	9%	12%
2010	14%	16%
2011	36%	13%
2012	50%	19%
2013	45%	15%
2014	31%	18%
2015	27%	8%
2016	31%	18%

Table 1.2 presents the trend regarding the profitability of insurance and *takaful* firms, which indicates the operating performance of the industry. Poor profitability or losses reflects the negative return on asset (ROA) and negative return on equity (ROE). The values of the ROA and ROE contribute to the negative trend (loss) from 2008 to 2011. The *takaful* sector obtained the profit from 2012 to 2014 and then recorded losses in 2015 and 2016. Although *Takaful* industry is in expansion period, and reflects high growth rate, it is very difficult for the business to survive with continuous losses and become a threat to its survival in long run.

Table 1.2
comparison of return on asset and return on equity between Takaful and Insurance firms from 2008 to 2016

	Return on Asset		Return on Equity	
Year	*Takaful*	Insurance	*Takaful*	Insurance
2008	-4.4%	-1%	-6.5%	-4.3%
2009	-4.07%	1.71%	-6%	7.8%
2010	-4.27%	1.32%	-8.9%	6.8%
2011	-0.97%	1.43%	-2.8%	8.1%
2012	0.92%	2.11%	3.9%	13.3%
2013	0.82%	1.88%	4.8%	14.7%
2014	0.14%	1.7%	1.1%	15.1%
2015	-2.31%	1.93%	-21.9%	18.3%
2016	-1.46%	1.58%	-16.4%	16.3%

The trends of growth are associated with a number of tough challenges that are hindering the growth of the *takaful* sector in Pakistan; such as low income of majority of the citizen, inflationary trends, and unstable macroeconomic factors. Moreover, the frequent electricity and gas shortages in Pakistan and exclusive expansive war against terrorism are deterring the economic growth and social stability of Pakistan (Awan & Khan, 2014). Pakistan has suffered almost US$ 80 billion after joining the US led "war on Terrorism" including the 50,000 causalities in terrorist attack (The News, 5 December 2014).

Takaful sector is also facing the challenges due to its structure and limitation to invest only in *shari'ah* compliant business. For example, insurance companies have more opportunities as compare to the *takaful* companies, given the condition to trade and invest only in *Shari'ah* compliant products. Islamic capital market including the sukuk and equity securities are progressively getting mature in Pakistan.

It is therefore argued that despite great growth potential for *takaful* operators in Pakistan and many efforts to develop this industry, the performance of the *takaful* industry reflecting the mix results for the nine years from 2008-2016 poses an important issue

since growth and expansion are very progressive but profitability score is poor. There are certain challenges for *takaful* companies in Pakistan including development of profit-oriented underwriting models, better terms and arrangements with the reinsurer, and tapping the less risky business sectors in accordance with *shari'ah* recommendations.

1.3 Problem Statement

The *Takaful* progress is remarkable in many Islamic states like Malaysia with 23% growth, UAE 15.20%, Saudi Arabia 60.70%, Bahrain 6.20%, and Qatar 45% compared to Pakistan's 5% (Kaunain & Akhtar, 2016). In contrast, the three decades prior to 2005 was a period of stagnancy for Islamic insurance in Pakistan, as no progress was witnessed in the *takaful* industry due to unsuitable regulatory and legal frameworks and a lack of support on the part of the central governments of Pakistan (Kaunain & Akhtar, 2016).

The insurance sector of any country can take major part in the economic growth and development (Brainard & Schwartz, 2008; Ward & Zurbruegg, 2000) and especially in developing countries. This sector has an inactive role in the economic growth and development (Sumaira & Amjad, 2013). Profit is one of the most important objectives of firms because the management wants to maximize the owner's wealth. Profitability is an important determinant of performance (Malik, 2011). Every firm is most concerned with its profit and income, similarly in Takaful firms. Figure 1.2 provides the score of profit for the *takaful* companies operating their business in Pakistan. The figure indicates the clear variation, showing losses from 2008 to 2010. After obtaining profit from 2011 to 2014, the takaful industry experienced decline in profit and heavy

losses in 2015 and 2016. This declining trend in profit is a major issue currently faced by the *takaful* companies operating in Pakistan.

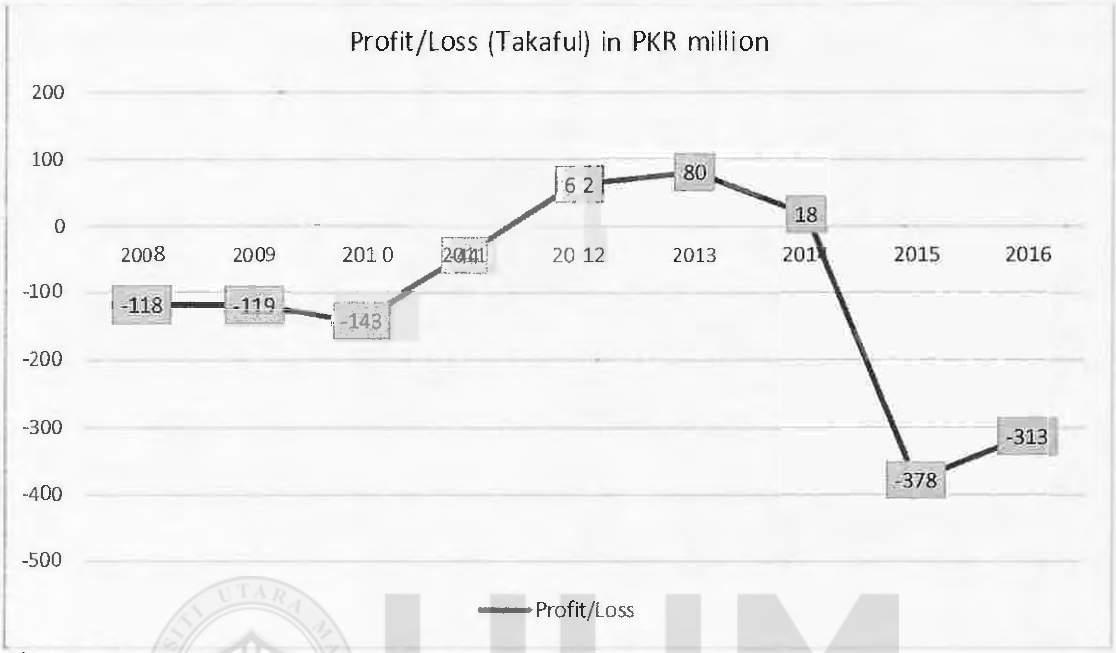


Figure 1.2
profit and loss of Takaful firms from 2008 to 2016

Profitability measures are important to a company's managers and owners. it is typical for a company in its infancy stage to experience high growth but with losses during the first few years of its operations. However, in the medium to long term, it is important for the *Takaful* firms to be profitable, as no business can survive in the long-run without earning profits (Boadi, Antwi, & Lartey, 2013).

Poor profitability resulted in a negative Return on Equity (ROE) as shown in Figure 1.3. Although ROE is negative in initial years (2008-11), however, it recovered in 2012, 2013 and 2014 with an increasing trend but turned negative in 2015 and 2016. Still, it is far behind than conventional insurance, and a potential threat to the *Takaful* sector as a viable business entity in Pakistan. For instance, figure 1.3 reflects the negative profitability for the *takaful* firms whereas the profitability for the insurance sector

remain positive for the same period. The large negative percentage of profitability is the main issue faced by the *takaful* industry in Pakistan which threaten the survival of the *takaful* firms in Pakistan economy.

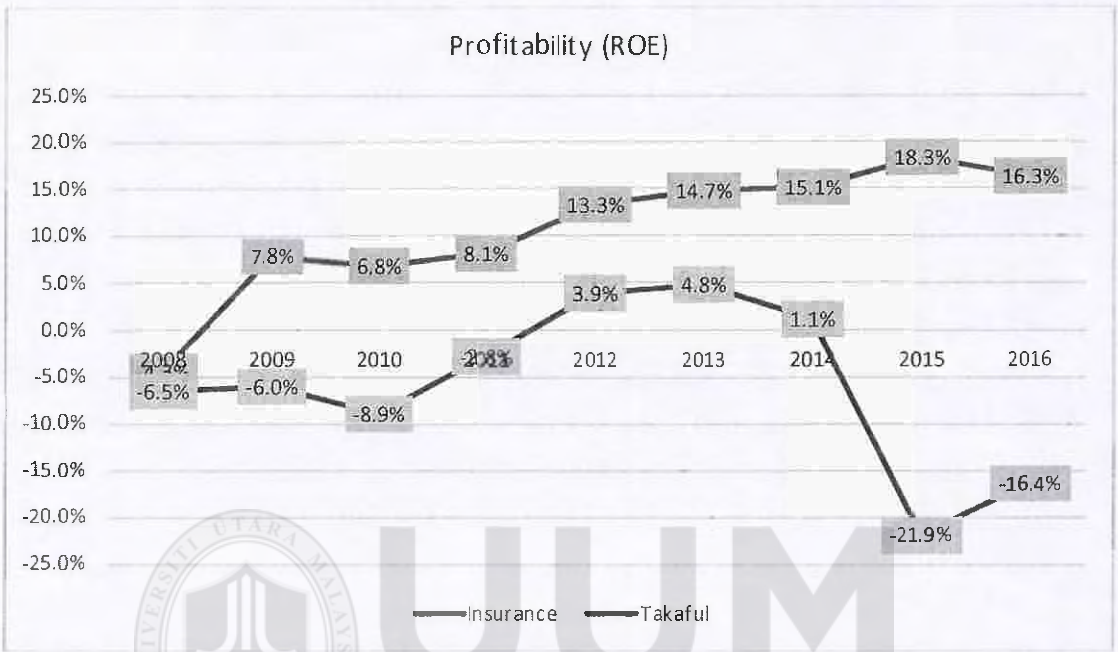


Figure 1.3
comparison return on Asset between Insurance and Takaful firms

Pakistan as a developing country has a significant less number of insurance companies as compared to the other Asian countries like Sir Lanka and India ("State Bank of Pakistan, 2005,")("State Bank of Pakistan, 2005,"). The second problem is that the Insurance sector of Pakistan is facing multiple external challenges like political uncertainty, floods, terrorist attacks and severe energy crisis. All these external factors badly effects profitability and premiums of insurance firms (Malik, 2011; Rahman, Kakakhel, & Ali, 2017).

Usually, the return on asset (ROA) ratio and return on equity (ROE) ratio are commonly used as proxies of profitability and performance. As, *takaful* was in its infancy during the study period and *takaful* operators were expanding their branch network, product

range, investments, new portfolios and venues, they were facing even the negative values for these ratios as mentioned in figure above. In spite of the losses experienced by the *takaful* companies, it was noted that the *takaful* business is flourishing in Pakistan economy. The annual reports of State Bank of Pakistan (SBP), Securities Exchange Corporation of Pakistan (SECP), Insurance Association of Pakistan (IAP) and news are reporting that after the startup of *takaful* business in 2007, within a decade its share approached to 13% of the insurance industry. This shows that in Pakistan's financial market, there is a lot of opportunities for the growth of *Takaful* business ("International The News," 2017). Moreover, during the last three years, the compound annual growth rate (CAGR) of gross contributions is 39.2% received by the *takaful* companies ("The express tribune, September 7, 2015,"). However, *takaful* industry at the age of ten years has competition with the well-established insurance firms. The issue is the question of why are the *takaful* companies making losses despite of higher business volume? Are they not efficient in managing their costs or not efficient in handling their resources? These are probing questions which have not been answered. However, these unresolved issues warrant this study to be undertaken to examine the efficiency problems from the aspects of Technical Efficiency, Pure Technical Efficiency and Scale efficiency.

Quite a number of studies tried to evaluate the performance and efficiency of the insurance and *takaful* firms. However, these studies have produced paradoxical results. For instance, studies like Biener et al. (2016), Al-Amri (2015) and Zimková (2015) found that technical, cost and allocative efficiencies have improved in GCC, Switzerland and Slovakian insurance industry whereas Alhassan and Biekpe (2015), Awan and Iqbal (2015) found that the insurance industries in South Africa and Pakistan are inefficient in technical and scale efficiencies respectively. Therefore, the

contradictory results of the previous studies suggest that still there is a gap for further research and there is a need to investigate, and verify past findings regarding the technical, pure technical and scale efficiencies of the insurance and *takaful* industry of a developing country like Pakistan.

Pakistan has experienced dramatic changes in economic conditions (Awan & Tahir, 2015). *Takaful* industry being embryonic during the study period experience new expansion opportunities while subject to new competitive pressures. Production of output relative to input indicates relative technological differences between insurance and *takaful* industry. According to the Coase (1937), the theory of the firm deal with the supply of goods for profit maximization. Productivity gains result in increased output production from a fixed set of inputs (or, alternatively, as a reduction in input needed to produce a fixed set of outputs) with respect to particular time (Weiss, 1991). For the panel data, Malmquist productivity index (MPI) can decompose the productivity change into technical change which identify the inadequacy or improvement in the performance and technical efficiency change which translate the convergence toward or the divergence from best practice on the part of the remaining firms. The value of the decomposition is that it provides information on the source of overall productivity change in the firms (Cummins & Xie, 2016; Mansor & Radam, 2000). Measurement of specific output, input, and productivity can evaluate the productivity change and its dimensions for *takaful* and insurance industry of Pakistan. The major issue for the *takaful* operators is that after the delayed start in 2005, whether the productivity of the *takaful* firms is up to the mark or improving in competition with deep-rooted insurance industry. To date, there is no study yet to measure productivity

of both insurance and takaful companies in Pakistan using DEA. This is a methodological gap which this study intends to fill.

Past literatures also revealed that change in efficiency and productivity have contradictory results for the financial sector especially for insurance and *takaful* industry. Alhassan and Biekpe (2015), Luhnen (2009) and Cummins and Rubio-Misas (2006) observed incremental change in the productivity of insurance sector. in contrast, Biener et al. (2016), Md Saad (2012) and Cummins and Turchetti (1996) observed the productivity declined in Switzerland, Malaysian and Italian insurance industry because of inefficiency in technical and technological change.

The volatility in profits and performance among insurance and *takaful* companies advocates that firm-level attributes play vital role in effecting insurance/*takaful* companies' efficiency. Quite a number of studies examined the determinants of efficiency in the *takaful* and insurance industry and they investigate the key factors which determine the efficiency especially for the financial system of a country. Studies like Biener et al. (2016), Alhassan and Biekpe (2015), Noreen and Ahmad (2016), Kader, Adams, Hardwick, and Kwon (2014), Cummins and Xie (2013) and Luhnen (2009) produced the different results between the firm specific determinants and the efficiency of the firms. It is also observed from the past literature that firm size, market share, profitability and leverage are the key determinants of the efficiency for financial system, but the impact of these variable is not consistent and varies based on the nature of the market.

The growth of firm size could lead to scale economies and cost efficiency, as large insurers are expected to obtain large customer databases, share electronic equipment,

strengthen capital structure and to offer a wider range of financial products through multiple distribution channels. By and large, competition in products, investment and markets has forced insurers to become more cost efficient (Hwang & Gao, 2005). Literature in the field of insurance industry asserts that the firms with larger size could be efficient mainly because of their potential to realize optimal output, competition in product and they can easily exploit their economies scale and scope (Amel, Barnes, Panetta, & Salleo, 2004; Cummins & Xie, 2013). In this regard, Biener et al. (2016), Alhassan, Addisson, and Asamoah (2015), Luhnen (2009) and Hwang and Gao (2005) found that large firms are more efficient and profitable as compare to small and medium firms. It is also observed that due to larger size the process of accountability is becoming inefficient so there is an opportunity for the management to become inefficient and adopt the relaxed attitude. Rahman (2015) found that smaller firms are more efficient to utilize their inputs to produce outputs.

Studies by Fenn, Vencappa, Diacon, Klumpes, and O'Brien (2008) and Ansah-Adu, Andoh, and Abor (2011) described that variable of market share (MS) has positive significant impact on the efficiency of this sector. Whereas Yuengert (1993) and Cummins and Zi (1998) found that firms with significant market share are characterized by decreasing returns to scale. It has been argued that clients usually have preferences for those firms which reported higher profitability. The effect of profitability on efficiency is estimated by some studies and found the paradoxical results.

Studies including Rahman (2015) & Afza and Asghar (2012) found the positive relation between efficiency and profitability. On the other hand, it has been argued by Ataullah and Le (2006) and Casu and Girardone (2004) that profitability may affect efficiency negatively. Researchers have also estimated the impact of leverage on efficiency

including Dagogo and Okorie (2014), Pushner (1995), Foong and Idris (2012), Luhnen (2009) and Alhassan and Biekpe (2015) examined for the financial system and found the mixed results. Therefore, four variables including size, market share, profitability and leverage are selected to examine the key factors which might have significant influence on the efficiency of *takaful* and insurance industry for this study in Pakistan.

1.4 Research Questions

The research questions derived from problem statement are:

I. Are *takaful* firms more technical, pure technical and scale efficient than insurance firms in Pakistan for the period of 2008 to 2016?
2. What is the rate of change in total factor productivity, technological change, technical efficiency change, pure efficiency change, and scale efficiency change in the insurance and *takaful* industry from 2008 to 2016 in Pakistan?
3. Which of the factors (Asset Size, Market Share, Profitability and leverage) significantly influence the technical efficiency, pure technical efficiency and scale efficiency of insurance and *takaful* sector of Pakistan?

1.5 Research Objectives

The followings are the research objectives that are based on research questions:

I. To compare the technical, pure technical and scale efficiency of the *takaful* and the insurance firms from 2008 to 2016 in Pakistan.

2. To measure the rate of change in total factor productivity, technological change, technical efficiency change, pure efficiency change, and scale efficiency change in the insurance and *takaful* industry from 2008 to 2016 in Pakistan.
3. To identify the factor (Asset Size, Market Share, Profitability and leverage) which significantly influence the technical efficiency, pure technical efficiency and scale efficiency of insurance and *takaful* firms of Pakistan.

1.6 Significance of the Research

This study is imperative in nature because of the quest towards the performance analysis of insurance and *takaful* industry in the contemporary financial sector. This study focuses on the measurement of technical efficiency, pure technical efficiency and scale efficiency of the insurance and *takaful* operators working simultaneously in the same environment of Pakistan. Efficiency of the relevant firms is measured by evaluating the premium collected and investment income as outputs by spending the administrative expense, payments of the claims and the amount of equity as inputs.

This study extends the normal scope of insurance and *takaful* studies in Pakistan by comparing the productivity change for the *takaful* and insurance firms. Firstly, total factor productivity (TFP) change is measured to compare the productivity change index of insurance and *takaful* firm. This productivity change index is decomposed in efficiency change index (ECI) and Technological Change Index (TCI) to investigate the reason of change in factor productivity. This would give a new pathway to the policy makers of Pakistan to assess the progress of the insurance industry over the period of time. The outcomes of this study would be useful to formulate and enforce suitable policies and strategies for the betterment of Pakistan insurance and *takaful* industry.

Furthermore, this study will contribute to the literature by providing empirical evidence to evaluate the impact of regulation upon the entire industry.

Moreover, the study has taken key factors to determine the effect of these factors on efficiency of the insurance and *takaful* industry. Therefore, this study would help in policy building to improve the efficiency of the insurance industry. The fact that this study includes both the *takaful* and insurance firms as the sample of the study is significant too, for it will provide insights into the different/ similar impacts of these variables on the efficiency of Pakistani insurance/*takaful* firms in specific and the Pakistan insurance system in general.

This study may become a valuable document as empirical efficiency measurement and analysis of insurance/*takaful* sector is helpful to all the stakeholders in their decision-making in Pakistan. Governments and regulatory authorities may visualize the impacts of their policies on the performance of insurance sector and hence for the broader interests of economy they can readjust these policies for strengthening of financial sector. Similarly, this research will provide an opportunity to the management of the industry to compare their performance with their counterparts and therefore, design their strategic moves to overcome their weaknesses.

The findings of this study will also provide guidance which will be able to its management and policy holders to identify the control factors, which are responsible for any decrement in their efficiency, productivity and performance. This study will also help shareholders in making their decisions about the adjustment in their portfolio.

This research will also be valuable for the scholars and academicians as it might contribute in enhancement of knowledge base in the field of financial sector

performance analysis and its relevance with the monetary and macroeconomic policies. To the best of our knowledge, this study is the first of its kind because no other research has been done so far on the determinants of insurance/*takaful* sector in Pakistan. Moreover, this research will have a unique feature of combining multiple methodologies e.g. DEA, Malmquist Productivity Index and regression for the exploration of determinants.

1.7 Scope of the Research

This study addresses the issue of efficiency analysis of insurance*ltakaful* industry in Pakistan applying DEA, Malmquist Productivity Index and regression methods. This study focuses on financial aspect of efficiency, and for the empirical analysis, process the financial data collected from the annual reports of the 14 insurance and 4 *takaful* firms, State Bank of Pakistan, Securities Exchange Corporation of Pakistan and Insurance Association of Pakistan reports. This study focuses on the efficiency score, change in efficiency and productivity for the insurance and *takaful* firms operating in Pakistan. At the end, the impact of affective determinants upon the efficiency is estimated.

This study compares the efficiency of *takaful* and insurance firms of Pakistan over the period of 2008 to 2016, this study could not able to cover the period before 2008 because *takaful* companies in Pakistan started their operation after 2006.

1.8 Organization of the Study

In this chapter, the discussion on the background of the study, the research problem, the objectives of this study, significance of this study and its scope are provided. The

outline of the remaining part of this thesis is as follows. In Chapter 2, a review of literature relevant to the study and related theories is provided. The methodology of the study as well as hypotheses development is presented in chapter 3. In chapter 4, the empirical results of the study are presented and discussed. In chapter 5, conclusion about the overall results is drawn, contributions of the study are defined, acknowledgements of the study's limitation are made, and the implications of the study are identified. Also, this chapter discussed the potential issues for the future research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this modern era of advanced technology, financial sector became a back bone of each and every economy. Risk is the main ingredient of most of the business ventures. Financial sector is playing its significant role in mitigating the risk factors, i.e. banks are supplying the funds at reasonable rate of interest and insurance companies are reducing the degree of uncertainty at affordable premium. Whereas on the other hand stock market provides the investment opportunities to its investors (Prasad, Rogoff, Wei, & Kose, 2005). Due to the important role of the financial sector, market gurus are taking their keen interest in the functioning of this sector and always trying to measure the efficiency of this sector because efficient financial sector is indispensable for the expansion of the business and industry at national or international level (Kumar, Charles, & Mishra, 2016). It is also observed that the development of the economy is dependent on the efficiency of its different sectors and it is the same for the financial sector.

The objective of this chapter is to review the conceptual framework for the insurance and *takaful* industry efficiency study and to review the techniques that have been utilized in estimating the efficiency. Extensive researches were conducted by previous researchers as contained in most literature on insurance efficiency. The literature is drawn and reviewed based on the studies regarding major determinants of efficiency. In this context, the concept of insurance, *takaful*, its evolution and different models of *takaful* are discussed in section 2.1, reviews of the efficiency definition and

classification are indicated in Section 2.2 and Section 2.3 that explain the methods of measuring efficiency. Section 2.4 reviews the literature on efficiency. Thereafter, Section 2.5 reviews the previous literature on determinants of efficiency and underlying theories of efficiency are discussed in Section 2.6. Lastly, this chapter ends with a conclusion in Section 2.7.

2.2 Insurance

In this world, risk is a vital part of this life. the main factor of every action of life. It exists in the all course and business of daily life and every human is always busy to minimize it. Hargraves and Hadley (2003) discuss the human nature of minimizing the risk factor which gave a room for the idea of insurance because the contract of risk is consisting on the idea to minimize the risk of any unfortunate event.

Pfeffer (1956) explains the insurance contract, where the insurer reduces the risk of a policyholder through a guarantee, against the premium paid by the policyholder, on the promise for the recovery of specified economic loss. Whereas Dorfman (1982) defines that the service of insurance as a commercial enterprise which undertakes, in exchange of scheduled payments from the owner of asset, to take over the risk of loss of assets on the happening of particular event.

Obaidullah (2005) defines the insurance as a risk-sharing contract (policy) between the parties, in which first party (insurer) undertake to indemnify the second party (insured) for specified losses against the predefined periodic payments. It is a device for the transfer of risk to some other party used by the individuals or associations against the paid consideration.

In the contract of insurance, the insured is compensated either by a specified amount or the complete recovery of the subject (insured property or object), as determined in the contract. The insurer intended to get the more premium than the amount of compensation to avoid the loss. If the certain event does not happen, the Insured lose the premium amount and the insurer gets the profit (Ivamy, 1993). The concept of the insurance (to get the profit and avoid the risk) is according to the human psychology and its presence can be found in the past. The evolutionary process, growth and progress of the insurance industry is discussed as under.

2.2.1 Evolution of Insurance

The concept of insurance is always available in the history of human life because everyone wants to protect himself from any damage, agony and loss and the insurance is its safeguard. The first classified insurance impression was the sea loan. This was a debt loan used to finance the marine commerce and was only payable on the safe arrival of the consignment (Kohn, 1999; Trenerry, 1926). The proper insurance business was the marine insurance initially started in the European continent (Fisher, 2009). In 1600's a coffee shop, Lloyd's coffee shop, become the meeting point. Afterwards, in 1720 Lloyd's started a newsletter which converted to a committee to manage the under writers (Trenerry, 1926).

First fire association named Feur Casse was incorporated in 1591 (Holdsworth, 1917). First life insurance policy was written on 18th June 1536, whereas the first life insurance company was incorporated in London on 1699 in the name of "The Society for the Assurance of Widows and Orphans". Life insurance business started in the United States of America in 1759. Whereas "New England Life" was the first mutual life

insurance company incorporated in 1835 (Holdsworth, 1917). Initially, insurance business was regulated in the Europe and United States of America. Insurance laws were systemized on mono-line basis. Insurance companies were only allowed to underwrite a single line according to law whereas multiple-line operations were allowed in late1940s (Hacker, 1998).

After the independence in 1947, the insurance business initially regulated by the Insurance Act, 1938 administer by a department of Insurance supervised by Ministry ofCommerce (Malik et al., 2011). Seventy-seven foreign and seven domestic (all state owned) companies were in operation at the time of independence. In 1953, Pakistan Insurance Corporation incorporated to encourage the local private sector insurers. Which resultant in the increase of local firms to sixty whereas the foreign companies decrease to seven till 1972 (Malik et al., 2011; Noreen & Ahmad, 2016; State Bank of Pakistan, 2005). Moreover, economic progress in 1960s further encouraged the insurance business in the country and the number of local insurance companies increased to 47 by 1971. However, the foreign company's number in Pakistan decreased to 25 in 1972 whereas this number was 77 in 1947. Another reason for the decline was political uncertainty and separation of East Pakistan (Afsar, 2006; Malik et al., 2011).

The insurance industry of Pakistan was nationalized in 1972, and all the life insurance companies present by that time are emerged to State Life of Pakistan including all of the liabilities and assets of those firms of private sector. Financial sector reforms, like the other developing countries, initiated in Pakistan in early 1990s. The government took the necessary actions to facilitate the private sector but the government life insurance company dominant the market due to its large number of clientage, huge

assets, big network, low premium rates and expertise. Whereas, private sector grow slowly in non-life sector due to is professional in experience and small assets as compare to the government sector (Noreen & Ahmad, 2016; State Bank of Pakistan, 2005).

The new laws of insurance were formulated and implemented in the name Insurance ordinance, 2000 approved on August 1999 which laid down a comprehensive regulatory framework for the insurance industry (Securities and Exchange Commission of Pakistan, 2000).

As insurance is an ancient concept and the protection against the risk and unforeseen loss. Every human wants to protect himself from the loss and wants to make some arrangements from the unforeseen events, however, there are some items in the insurance contract which are prohibited in *shari'ah* and Muslims are not permitted to sign those contracts which have those items which are prohibited by *shari'ah.* It is a well-known phenomenon that the insurance industry (*takaful*) under the umbrella of Islam has its own unique characteristics. Whereas, the structure of conventional insurance firms does not match with the Islamic injunctions and its basic norms. In the following section an effort will be made to discuss briefly these injunctions and norms.

2.2.2 Insurance in Islam (*Takaful*)

Risk and uncertainty are the necessary ingredient of this worldly life and human being is consistently exposed to ruins and misfortunes like death, accidents and loss of wealth or property. Although every Muslim believes in *Qadha-o-Qadar*, however it is the responsibility of everyone is to explore the ways to avoid the disasters and calamities within its legal resources and try to minimize the loss from the unfortunate events. Thus,

the concept of hedging and protection from any future misfortune is an ingredient of the human psychology.

Islam is a religion whose social system is based on this assumption that the ultimate ownership of everything in this world belongs to Allah almighty and human being is the only custodian of his blessings and only can possess his blessings within the prescribed way. The concept of Islamic finance is grounded on numerous doctrines containing some prohibitions including *Gharar* , *Riba* and *Maysir* whereas conventional insurance concept centered on the ideology contradictory to these rules and these are the main challenges to the emergent Islamic insurance market (Komorowski & Kubiszewska, 2016).

Shari'ah is a set of rules which defines the way of life defined by the Almighty Allah for its creation and servants. These rules of *shari'ah* are derived from the three main sources of Islamic Jurisprudence which are; the *Qur'an*, *Sunnah* and *Fiqh* (Billah, 2001). *Takaful* is the substitute of the conventional insurance prescribed under the rules of *shari'ah*. *Takaful* is an Arabic term *whereas* its root is *Kafala*. The literary meanings of the word *Kafala* is joint responsibility or guarantee. In the modern financial terminology, it is known as *shari'ah* compliant insurance or Islamic insurance.

Takaful is an Islamic insurance which is based on two basic principles, first is mutual cooperation and second is the support of a community (number of people) agreed on jointly protection of each other. Its purpose should be to protect the policyholders during the difficulty or trouble from the ascertained equity (Hussain & Pasha, 2011).

Bekkin (2007) elaborates the *takaful* as a pact which provides the guarantee to the every member of the group against the specified loss or damage faced by any member whereas

Wahab, Lewis, and Hassan (2007) defines the mechanism of *takaful* that the main concept of Islamic insurance (*Takaful*) is risk pooling and the services manager (*takaful* operator) only gets the professional fee and is not authorized to take other benefits in the light of prescribed *shari'ah* principles.

The basic concept of *takaful* is based on the ideology of cooperation, social solidarity and the loss recovery of the members (Ayub, 2003; Usmani, 2004). *Takaful* is a framework of mutual indemnity, where a group of people contributed a sufficient amount of money in a common pool with the ideology to compensate the claims of the members in the time of agony (Maysami & Williams, 2006). The ideology of *takaful* which makes it *shari'ah* compliant is based on two concepts, one is *Tabarru'* (donation) and the second is *ta'awun* (mutual cooperation). These concepts are described in detail as bellow.

2.2.2.1 *Tabarru'*

Tabarru' (donation) is the underpinning element that differentiates *takaful* from conventional insurance. This is because the former business operates on a risk sharing basis, whereas the latter provides risk transfer (Bakar, 2009; Muhamat, Jaafar, & Alwi, 2017) and it is clearly described in the Holy *Qur'an* and *Hadith* as under;

"*Help one another in al-Birr and in al-Taqwa (virtue, righteousness and piety): but do not help one another in sin and transgression*"

[Al-Maida 5: 2].

Tabarru' literary meanings are to contribute, grant or donate anything. In *takaful* perspective, *Tabarru'* is meant by donation or contribution of a particular amount made

by the members of a specific group of people in a pool under the supervision of *takaful* operator (Obaidullah, 2005). The essence personified in this concept is the thought of helping and fortification of the other participating members beside the own protection. The operation would become a conventional insurance transaction without the impression of donation. In the *takaful* contract, the risk factor is equally shared by the participant because the *takaful* operator is only the custodian of the fund and the ownership belongs to the members (Muhamat et al., 2017).

2.2.2.2 Ta'awun

The second basic necessity of *takaful* in Islam is based on the notion of mutual assistance (*ta'awun*), mutual security and responsibility (*tadhamun*) (Ali, Hassan, & Hasan, 2015). This concept of ta'awun is derived from the verse of Holy *Quran* (Al-Ma'idah 5: 2) mentioned above and Hadith narrated by *Imam Ahmad bin Hanbal and Imam Abu Daud as,*

"Allah will always help His servant for as long as he helps others."

The principle of mutual security and responsibility can be explained by a hadith mentioned by *Imam al-Bukhari and Imam Muslim as,*

"The place of relationships and feelings of people with faith, between each other, is just like the body; when one of its parts is afflicted with pain, then the rest of the body will be affected

Applying this concept to the *takaful* perspective, first concept of *Tabarru'* is used for collecting the donations and afterwards the concept of *ta'awun* is applied to use the sum of amount for the betterment and rehabilitation of the disastrous member (Obaidullah,

2005). For this purpose, the premium, contributed by the *takaful* contributors, is segregated into two main accounts: Participant Special Account (PSA), or the risk fund, and Participant Account (PA), or the investment fund (Muhamat et al., 2017)

According to the abovementioned discussion it is clear that protection from loss is not prohibited by Islam but actually there are some components in insurance which are not approved by *shari'ah.* The components included in the contract of insurance which are prohibited by Islam are briefly defined as under.

2.2.2.3 *Riba*

Islamic finance is the real application of Islamic Jurisprudence (Islamic Law) which gives the ruling regarding the commercial and financial matters. These rules are derived from the Holy *Qur'an* and *Sunnah* (Masud, 2010). The contract of conventional insurance is not permitted in the *shari'ah* because of the component of *riba* (Billah, 2007). Moreover the conventional insurance has no constraint about the investment projects which are not permitted by the Islamic rules and regulations (Jaffer, Ismail, Noor, Unwin, & Ajayi, 2010). All the Muslim jurists have the consensus that *Riba* has no room the financial transactions and it is completely prohibited. Either it is on productive or non-productive loans or it is in the form of simple or compound as mentioned in the *Qur'an.*

"Those who benefit from interest shall be raised like those who have been driven to madness by the touch of the Devil; this is because they say: "Trade is like interest" while God has permitted trade and forbidden interest."

[*Al-Baqarah* 2:275]

"O ye who believe! Be afraid of Allah and give up what remains (due to you) from Riba (usury) (from now onwards) if you are (really) believers"

[*Al-Baqarah* 2:278]

"O believers take not doubled and redoubled interest, and fear God so that you may prosper. Fear the fire which has been prepared for those who reject faith, and obey God and the Prophet so that you may receive mercy"

[*Al-Imran* 3:130-2]

"That they took riba (usury), though they were forbidden and that they devoured men's substance wrongfully – We have prepared for those among men who reject faith a grievous punishment"

[*An-Nisa* 4:161]

"*And whatever riba you give so that it may increase in the wealth of the people, it does not increase with Allah.*"

[*Ar-Rum* 30:39]

However, *shari'ah* scholars believe that *riba* is independent from temporal and spatial dimensions and have the consensus that *riba* is not permitted in every circumstances (Muslehuddin, 1982; Rashid, 1993).

2.2.2.4 *Gharar*

The *Gharar* is like a sale deal to sell the pearl before the dive of diver, sell the crop before it harvested, because at that time quality of the product to sell can't be established and there should be chances of loss for any party which tends to gambling are forbidden

in Islam (Saaty, 2008). Transaction with high degree of uncertainty is prohibited in Islam. Contract should be transparent and clear in its term and conditions under the of *Shari'ah* rulings.

An established rule of Islamic Jurisprudence (usul al-*Fiqh*) is that necessity (*darura*) solidify the prohibition into permissible if the issue belongs to public interest. As the insurance is inevitable in the modern era, which makes it closer to necessity (*darura*). However, utmost efforts should be made to eradicate the *Riba* and minimize the factor of uncertainty from the every conditions of the contract before it is allowing as *Gharar yasir* (minor uncertainty) (Rashid, 1993).

2.2.2.5 *Maysir*

Maysir is the extreme form of the *Gharar* . If the insured matter contains any speculative element, it is prohibited and not allowed in the Islamic model of insurance (*takaful*) (Salamon, Ebrahimi, & Yusoff, 2015). The amount paid by the insured belongs to insurer in conventional insurance whereas the contribution amount belongs to participant in *takaful* (Saaty, 2008).

Insurance is a form of wagering as the insured is gambling. In the case of general insurance, the insurer has the intention that the misfortunate event will occur, and he will recover the amount paid in the form of premium. In the case of life insurance, insurer gamble his life in the form of guarantee that he will survive till the insured period and will enjoy the full amount of premium in addition to the amount of interest (Wahab et al., 2007). The Holy *Qur'an* directly address regarding the prohibition of *Maysir* as under

They ask you about wine and Maysir. Say, "In them is great sin and [yet, some] benefit for people. But their sin is greater than their benefit".

[*Al-Baqarah* 2:219]

"Believers, wine and gambling, idols and divining arrows are abominations from the work of Satan. Avoid them, in order that you prosper"

[*Al Maida* 5:90]

The gambling has only inspiration of gain in the case of win whereas insurance has the desire to recover the damage in the case of tragedy or loss. The claimed amount never be entitled as profit or gain because it is only the compensation of loss which already been incurred (Siddiqi, 1985).

The benefits of the insurance contract are dependent on the consequence of future events which are not in the knowledge of the parties at the time of contract. This feature of uncertainty indulges the component of *Gharar* into the insurance which is prohibited by *shari'ah*. In insurance, mutual consent of the parties could not be taken in the presence of inadequate information, which is a basic characteristic of a valid contract (Wahab et al., 2007).

After seeking all the above-mentioned debate Muslim Jurists come to the conclusion that there should be a tool which is according to the rulings of *Qur'an* and *Sunnah*, free from all the components which are not allowed in the teaching of Islam and provide the Muslim protection from Risk and expected loss. Concept of *takaful* like a cooperative insurance, where the members of takaful contribute a certain sum of money to a common pool (Saaty, 2008). The concept of *takaful* can be found even at the time of prophet Muhammad (P.B.U.H) and also practiced in the time of caliphate but in the

modern era, the concept of Islamic finance was first described with the creation of the first Islamic Financial Institutions (IFI) in the early 1970s. How this concept of *takaful* evolved with the passage of time, it is described in detail as under,

2.2.3 Emergence of *Takaful*

The concept of mutual support and compensation accustomed (*takaful*) was present and even practiced before the period of Prophet Muhammad (P.B.U.H) (NuHtay, Hamat, Ismail, & Salman, 2015). This system was accustomed in different tribes. All members of the tribe contribute for the effective member at the time of catastrophe till the recovery of the complete loss. At the time of *Aaqilah*, blood money or any loss in case of disaster shared by whole of the tribe. Islam also accepted this principle of mutual responsibility and compensation (Billah, 2003; Rashid, 1993; Saaty, 2008). Before revelation of Islam, merchants of Makkah have formed a mutual fund for the rehabilitation of the victims by the natural hazards faced in the trade journey of Iraq, Syria etc. even once Prophet Muhammad (P.B.U.H) also contribute in such a fund when he was on a trade journey with the capital of Khadijah (Rahman, 1979).

In the last century, Ibn Abidin recorded a marine insurance named *Sowkrah* at the time of Othman Empire. In this system a Harbi (a non-Muslim of a non-Muslim country) is involved as guarantor for the safe arrival of the trade ship and cargo against a specified amount in case of trade with a Harbi country (Aris, 2004; Klingmuller, 1969; Rashid, 1993). Later on the Ottoman Maritime Code of 1863 and the Ottoman Law of Insurance 1874 legislate the marine and non-life insurance respectively. It was believed that the life insurance idea is against the Islamic ideologies and not permissible (Hassan, 1985).

In the recent past, the Muslim world including Islamic countries and the countries with significant Muslim population encouraged to subjugate its dignity in the nations encouraged the provision of Islamic finance in early 1970s. Islamic Financial products including *takaful* are the services to Muslim *Ummah* (community), according to the rules define by Islamic jurisprudence. *Takaful* is a welfare scheme and is established to fulfill the needs of Muslims business men and individuals. The basic theme of introducing the Islamic finance products is to provide an example of socio economic system justice and equity (Al-Amri & Hossain, 2015; Ali, 2006). This was followed with the creation of the first Islamic Financial Institutions (IFI) in the early 1970s and included banks and *takaful* companies. *Takaful* companies first established in Sudan in 1979 and gradually started busiuess in different Islamic as well non-Islamic countries with Muslim population. The opening and starting of *takaful* companies established in different countries as discussed in the following paragraphs.

The Islamic Insurance Company Ltd. as a first insurance company was established in Sudan in 1979 to provide the insurance solution in the country according to *Shari'ah* rules (Al-Amri & Hossain, 2015; Ali, 2006; Bekkin, 2007; Roderick & Habiba, 2008). In 1979, the Islamization of insurance sector also started in UAE and the first *Takaful* Company named SAAMA (Islamic Arab Insurance Company) was established. Later on this *takaful* company expanded its business to other countries of the region like Egypt, Jordan, Algeria, Tunisia and Bahamas (Al-Amri & Hossain, 2015). Malaysia also responded on the call of the Majma al-*Fiqh* meeting in 1985 for *takaful* insurance. *Takaful* Act 1984 was enforced and according to this law the central bank of Malaysia is supervising the Islamic financial institutions (Ali, 2006; Mokhtar, 2008). In Indonesia, *PT Asuransi Takaful Keluarga*, first company which offers the *takaful*

products was established in 1994 (Al-Amri & Hossain, 2015). In Saudi Arabia, the Cooperative Insurance Companies Law was enforced on 20 November 2003 along with its implementing regulations on 23rd April 2004 (together the "Cooperative Insurance Regulations") (Abu-Hussin, Muhamad, & Hussin, 2014; Al-Amri & Hossain, 2015; Qureshi, 2011).

In Pakistan, the Securities and Exchange Commission of Pakistan (SECP) which is a regularity authority was established in accordance with Insurance Ordinance 2000. After the insurance reforms, under the guidance of Insurance Ordinance 2000, provisions were made for *takaful* business ("State Bank of Pakistan, 2005,"). Five *takaful* companies including three general *takaful* operators and two family *takaful* operators have started their business in 2005. The *takaful* industry has seen an excellent growth, i.e. the volume of Islamic finance in Pakistan was more than $6 billion in 2015, and still it is expected more growth in this industry. Realizing the importance of Islamic finance, the SECP established the Islamic Finance Department (IFD) in February 2015. The department is fully determined to contribute to the growth of this sector, considering as its religious and national responsibility (Noreen & Ahmad, 2016; "Securities and Exchange Commission of Pakistan 2016,").

Owing to its growth and profitability, the *takaful* business is also become popular in non-Islamic world. In Singapore, *takaful* and Islamic banking promote the economic development of the Islamic community and comprises approximately 15 percent of the population. A number of *takaful* companies are also operating their business in USA which are providing *takaful* life and non-life insurance coverage's in personal and commercial lines in USA (Al-Amri & Hossain, 2015).

The progress of the *takaful* industry shows that *takaful* business is flourishing in the different parts of the world and it is not limited to the Islamic world. It is also getting response from the non-Muslim countries with Muslim population. It is also interesting to note that with the passage of time the range of *shari'ah* compliant products are also expanding and to some extent able to compete with the conventional insurance. It is also worthwhile to note that *Shari'ah* experts have developed some practical models of *takaful* according to the *shari'ah* guidelines. The following sub-section briefly presents these models.

2.2.4 *Takaful* Business Models

It is a well-known phenomenon that the spirit of *takaful* is not to generate the profit. However, in this real world most of the organization cannot run their business without generating the profit. Keeping that in view, a number of different business models of *takaful* are developed. These business models are developed under the umbrella of *shari'ah*. These models fulfill the religious requirement of the Muslim costumers living in different regions of the world. The details of these models are given below.

2.2.4.1 *Mudarabah* Model

The *Mudarabah* model is a partnership contract between two parties, one is the capital provider, participant, contributor or *takaful* insured called the *Rabb-al-mal* and the other is the *takaful* operator called Mudarib (manager). Participant invests in the shape of premium and the *takaful* provider act as a manager and this is his right to take the percentage of the profit. All the investment and business activities are applying the *shari'ah* permitted instruments. Two different accounts are being maintained, one is

business account which is maintained for generating the profit and the other is for the payment to the insured person in case of any claim. This is called as *Tabarru'* account. The **Figure 2.1** presents the flow chart of *Mudarabah* model in detail.

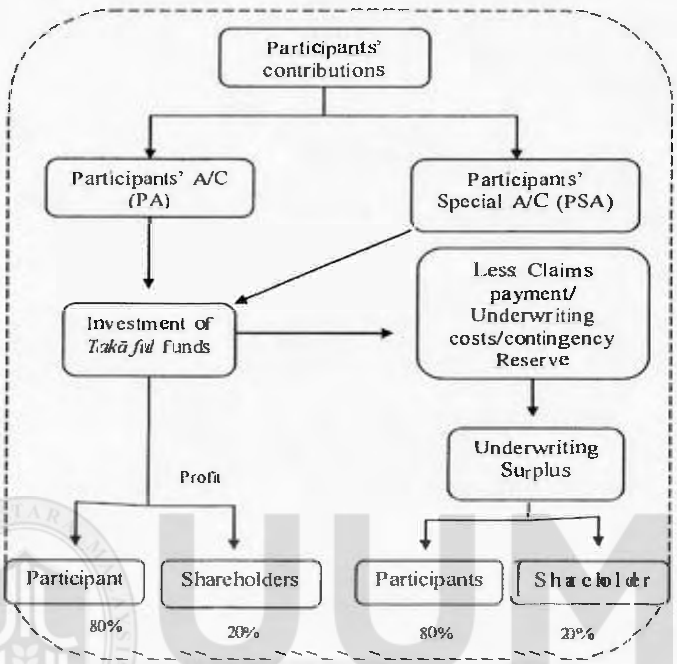


Figure 2.1
Mudarabah model
Source: (Akhter, 2010)

The *Tabarru'* account only belongs to the participants and no deduction can be made by the *takaful* operator (Hanif Akhtar, 2010; Kader et al., 2014; Pasha & Hussain, 2013; Rahman, 1979). This model is being used in Malaysia and Brunei.

2.2.4.2 *Wakalah* Model

Al Wakalah is a term built on the root word *'Wakalah '*. The word *'Wakalah '*appears in the *Qur'an* in several times and bears several meanings, but in spite of that, they are all used to indicate "a representation of a person on behalf of another person in certain dispositions" (Napiah, 1995).

In *Wakalah* model the contract is signed in between two parties, one is capital provider, participant and the other is *takaful* operator. *Takaful* operator provides all the services regarding managing the fund, investment of the fund in *shari'ah* compliant instruments, all other management services and charges a fixed predefined amount of fee against all of its services. This model is considered to be more transparent than the other models because this model has no hidden charges (Akhter, 2010; Kader et al., 2014; Wahab et al., 2007). The *takaful* operator charges the predetermined amount for his services which he provides so he has no share in the profit. The *Wakalah* fee should be pre-determined, pre-defined and approved by the *Shari'ah* Supervisory Board (Ayub, 2003). The flow chart of the *Wakalah* Model is illustrated in **Figure 2.2**.

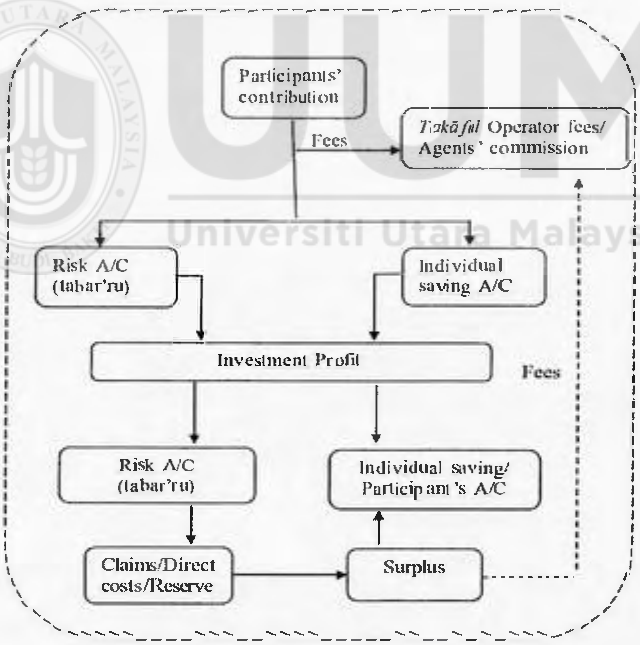


Figure 2.2
Wakalah model
Source: (Akhter, 2010)

Wakalah model is being practiced in Saudi Arabia by Bank Al Jazira, in Malaysia practiced by *Takaful* Ikhlas Sdn. Berhad and Commerce *Takaful* Berhad and also in Bahrain. (Al Sadah, 2005).

2.2.4.3 *Wakalah Mudarabah* (Combined) Model

The *Wakalah Mudarabah* model is the combination of two aforementioned models. The first *Wakalah* contract is made for the underwriting and the *Mudarabah* contract is for the investment purpose (Ali, 2016; Archer, Karim, & Nienhaus, 2011). This *takaful* model is also attributed and suggested by the AAOIFI (Accounting and Auditing Organization for Islamic Financial Institutions) (Tolefat, 2006).

As the underwriting business is concern, the *takaful* operator provides the services like receiving the contribution, arrangements of re-*takaful* and payments of claims and receives the *Wakalah* fee for all these activities. The *takaful* operator makes a second contract for investing the surplus contribution in the *shari'ah* compliant products. *Takaful* operator enters into a *Mudarabah* contract for managing all the business activities and receives a pre-determined percentage of the profit (Akhter, 2010). The operation of the model is defined in **Figure 2.3**.

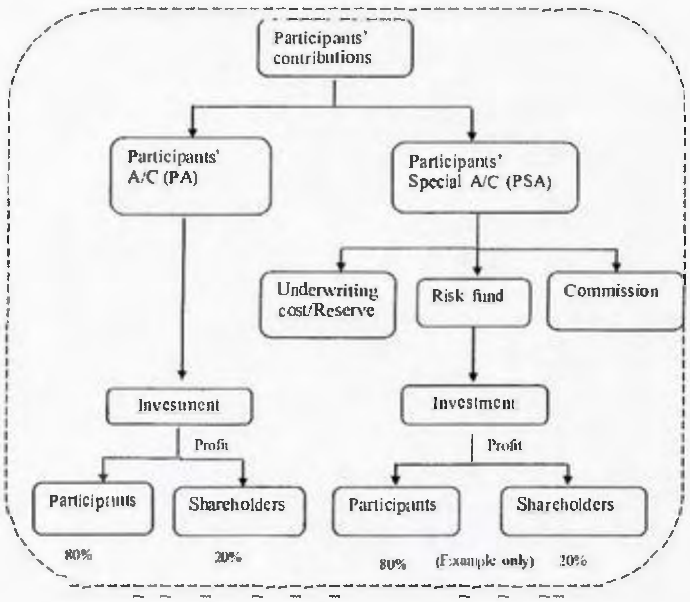


Figure 2.3
Wakalah Mudarabah (combined) model
Source: (Akhter, 2010)

Majority of the *takaful* operators in Middle East are applying *Wakalah Mudarabah* model. *Takaful* Nasional Berhad and Mayban *Takaful* Berhad (MTB) also applies this model in Malaysia (Tolefat, 2006). Obaidullah (2005) argues that as this model comprises the merits of *Mudarabah* as well as *Wakalah* model so it could be a unified methodology to homogenize *takaful* practices throughout the world.

2.2.4.4 *Wakalah* Model with *Waqf* Fund

This model is developed by a well-renowned *shari'ah* scholar Mufti Taqi Usmani from Pakistan. In this model, two different accounts are maintained, one is for shareholder's and the other is for *Waqf* fund. In case of any catastrophe, the payment to the claimant should be paid from the *Waqf* account. The *takaful* operator provides the services as an agent (*wakeel*) for both of the accounts. The *Waqf* account is used for the payments of the claims whereas the amount of investment account invests in *Shari'ah* compliant

investment products for profit. The *takaful* operator charges the *Wakalah* fee for its services (Akhter, 2010; Pasha & Hussain, 2013; Wahab & Rahim, 2006)

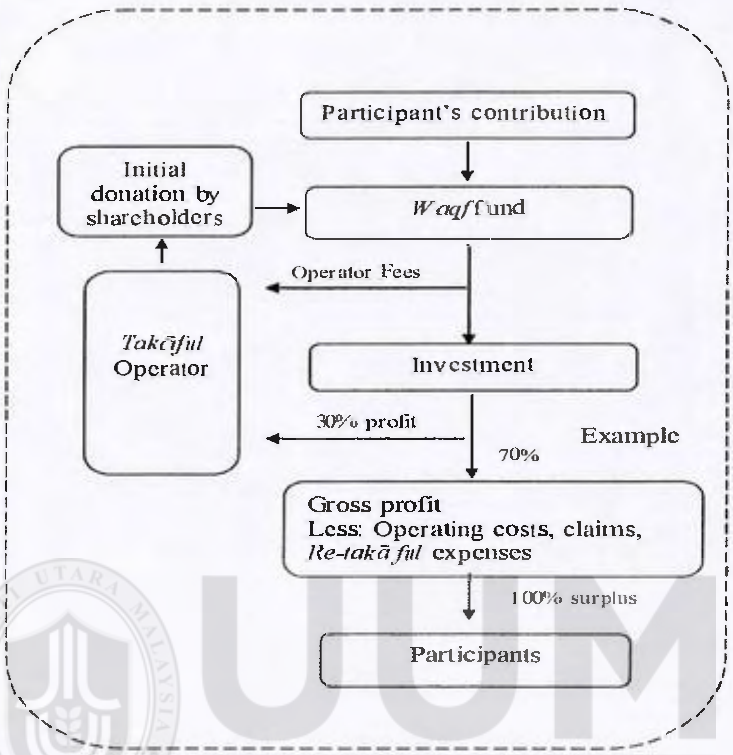


Figure 2.4
Wakalah model with Waqf fund
Source: (Akhter, 2010)

Wakalah Model with *Waqf* fund is applying by *takaful* operators in Pakistan and South Africa (Tolefat, 2006).

Every business requires the profit for its survival. It is observed that efficient firms are earning per unit more profit than the inefficient firms. In this competitive environment of business and trade, the management of firms is always trying to be efficient. Therefore, they are applying the best business techniques, using the least cost combination of inputs, launching the attractive products for their customers and introducing the new methods of management. They allocate a sufficient fund for the

activities of research and development. Their want to maximize the profit for their shareholders and also look after the interest of the stakeholders. Similarly, the management of the insurance (Islamic and conventional) companies are trying to follow the same path which is going towards the efficiency. The following section discusses the concept of efficiency in detail.

2.3 Efficiency

A traditional text book of Micro Economics teaches us about the efficiency, i.e. if any firm produces at higher isoquant with the same inputs or produces with fewer inputs on the same isoquant. Elaborate the economic theory, efficiency can be comprehended into economic efficiency and technical efficiency (Bromley, 1990). Economic efficiency comes under the macroeconomics whereas the technical efficiency comes under the microeconomics. Technical efficiency measurement is only limited to the technical and operational process of converting the input into output (Ascarya & Yumanita, 2009).

According to Coase (1937), efficiency is the process of the firm to maximize its output within the given limited inputs. In the current literature of economics, categorically efficiency is classified in to three types i.e. economic/allocative efficiency, technical efficiency and scale efficiency (Xiaogang, Skully, & Brown, 2005). According to Berger, Hunter, and Timme (1993) that the efficiency can be measured through the scale of average variable cost. That technique which has the lowest average variable cost is known as the best technique whereas which observes the highest average variable cost known as the worst technique. However, the efficiency can be measured by using the different concepts, for example, best utilization of the resources, higher output-input ratio, better performance relative to the other producing units, etc. In a nut

shell it is a relative phenomenon (Abbott & Doucouliagos, 2003). Figure 2.5 presents the efficiency analysis framework.

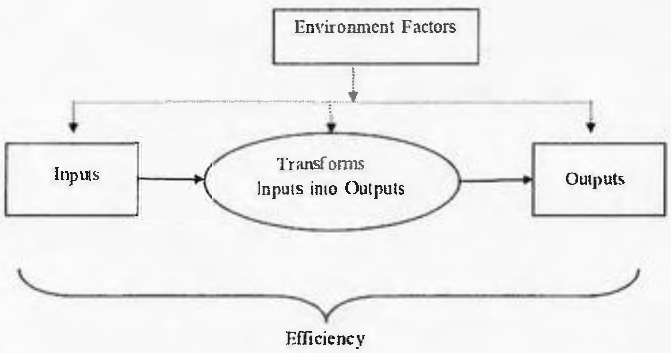


Figure 2.5
the efficiency analysis framework
Source: (Chu & Lim, 1998; Mokhtar, AlHabshi, & Abdullah, 2006)

After discussing the efficiency, it is pertinent to define the different forms of efficiency. The different types of efficiencies are explained in the following sub-sections.

2.3.1 Economic Efficiency

Economic efficiency is not just restricted to the maximization of the profit, it is a multidimensional and comprehensive concept, it is related to the whole economy, it requires resources should be allocated in an optimal manner, mitigating the chances of inefficiencies, goods should be produced with the least cost combination of inputs, etc. It is worthwhile to note that market indicates that which producing unit is efficient or not. The price mechanism guides us about the economic efficiency of the producing units. Thus, efficiency cannot be estimated without the availability of price series. However it is assumed that producing unit is declared as the economically efficient if it is producing with the optimal utilization of resources, applying the best existing technique and also producing at the lower level of per unit variable cost (Bauer, Berger, Ferrier, & Humphrey, 1998).

It is generally assumed that economic efficiency is composed of value engineering and value analysis technique. Value engineering is related to innovation whereas valve analysis is used for the current developed products. However, whatever the dimension of the analysis, it is always based on the minimization of the cost and maximization of the output, i.e. moving on the higher isoquant with the same level of inputs. It is also consensus among the experts that economic efficiency is based on the allocative and technical efficiency.

2.3.2 Allocative Efficiency

The phenomenon of allocative efficiency is related to the price, marginal revenue and marginal cost and the structure of the market. The level of production is determined where marginal cost curve intersects the marginal revenue curve under the perfect competition, however, under the monopoly producer can produce where marginal cost intersects the price/average revenue curve (Hassan, 2003). However, in most of the cases the price of the factor of production is determined by the market forces so these are not controlled by the producers themselves. Simultaneously the governmental regulations, which cause the market imperfections have a significant impact on the cost of production. In resultant the allocative efficiency depends upon the market share and the regulations of government, so this type of efficiency has a lot of uncertainties because of the structure of the market and policies of the government.

2.3.3 Technical efficiency

Technical efficiency is the proportion of the input of the firm with reference to the input of fully efficient firm producing the fixed output which means the technical efficiency

is the capability of a firm to produce output with the itemized inputs (Cummins, Weiss, Xie, & Zi, 2010). Technical efficiency can be observed from the production possibility frontier (PPF). If it is moving upward it implies that this is due to the technical efficiency. This shows the association between the units of inputs and units of output so in this case the prices of the factors of production are irrelevant. It implies that the conditions of market have no impact on technical efficiency (Barros & Mascarenhas, 2005; Bauer et al., 1998). Therefore, technical efficiency is actually the capacity of a firm to transform available several resources into the abundant financial services. In any economy a number of techniques are producing the same output with the different degree of productivity, among them the worst- as well as the best-techniques are working simultaneously whereas in between them a spectrum of techniques is working which are considered as the average techniques. However, that technique which produces with the least cost combination is considered as a best-technology (Banker, Charnes, & Cooper, 1984). Banker et al. (1984) further split the technical efficiency into pure technical efficiency and scale efficiency.

2.3.3.1 Pure Technical Efficiency

Chan (2008) defined pure technical efficiency as the additional consumption of the input resources for a specified output due to the operational management. Therefore, Pure Technical Efficiency is the ability of the management to save the input for producing a certain amount of output or to produce more output with a given level of input. In his opinion in this way one can increase the output by using the existing inputs or same output can be achieved by using the less inputs.

2.3.3.2 Scale Efficiency

According to Kounetas and Tsekouras (2007), scale efficiency is defined as a parameter to assume a level of average productivity of a firm on operating at optimum scale size. This is the point of time when the average productivity will be at its maximum level. Farrell (1957) explained this phenomenon through **Figure 2.6**. He assumed the hypotheses of constant return to scale (CRS), where firm produces a single output 'q' by using two inputs (x_1 and x_2). In **Figure 2.6**

S'S = Unit isoquant of the efficient firm (through this one can measure the technical efficiency)

P = Where two inputs produces the one unit of output

QP = Firms' technical inefficiency, i.e. all inputs can be reduced proportionally without declining the output, in percentage it is QP/OP

The expression stands for the proportion by which all inputs can be decreased. Thus, the firm's technical efficiency (TE) is usually measured as follows:

Technical efficiency= OQ /OP

This also equals to 1- QP/OP implying that its value ranges in between zero and one. Thus, the value indicates the level of the firm's technical inefficiency. For a full technical efficiency of a firm, the value is one. For instance, technically efficient point is a point such as Q lying on the efficient isoquant SS".

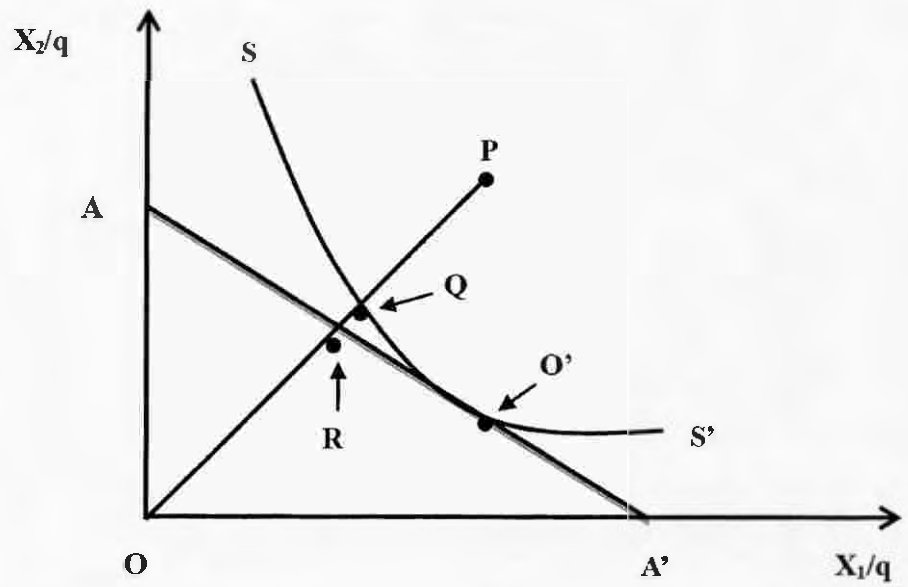


Figure 2.6
Technical and Allocative efficiency
Source: (Coelli, Rao, O'Donnell, & Battese, 1998)

If input prices are known and represented by the price line AA", then allocative efficiency (AE) can be calculated as:

Allocative efficiency= OR/OQ

If production took place at Q" instead of point Q, then cost could be reduced by the distance RQ. The overall efficiency or economic efficiency is defined as:

Economic efficiency= OR/OP

EE= OR/OP= TE ×AE = (OQ/ OP) × (OR/OQ)

After discussing the different types of efficiency, methods are defined which are used for the measurement of the efficiency. Econometric and mathematical are used for the measurement of efficiency. The details of these methods are given in the following section.

2.4 Reviews of the methodologies for measuring efficiency

In the literature one can find a number of techniques which are used by the different studies for the measurement of the performance of producing units. Among them frontier efficiency is considered as the best one and has an advantage over other techniques. In the current literature two techniques are widely used for the benchmark of the firms, i.e., parametric and non-parametric frontier techniques. However, majority of them are related to the financial services industry. It is worthwhile to note that among them the measurement of the performance, efficiency, productivity or the benchmark performance got the more attention. In the beginning because of its importance, most of the research was related to the banking sector performance like (Aggarwal, 1997; Berger et al., 1993; Ferrier & Lovell, 1990) or bank branch performance like (Schaffnit, Rosen, & Paradi, 1997; Sherman & Gold, 1985). However, in the last decade, these two techniques were also used by the researchers in the insurance industry and they measured the performance and efficiency of the insurance industry. One can see in the recent literature a number of studies measured the productivity, performance and efficiency of the insurance industry by employing the frontier techniques i.e. parametric (econometric) approach and non-parametric (mathematical programming) approach. In this current section an effort will be made to discuss those studies which recently published in this field and applied the above-mentioned approaches.

As it is mentioned above that the current study aims to measure the efficiency, productivity and performance of the insurance industry. So, one can realized that it means to divide the data into different segments, i.e. from worst- to best practice. Frontier analysis is the best one, it does not matter which technique is being used. By using this methodology, management can identify the issues of inefficiency and also

able to solve them accordingly. The different approaches for the measurement of efficiency are presented in the **Figure 2.7**.

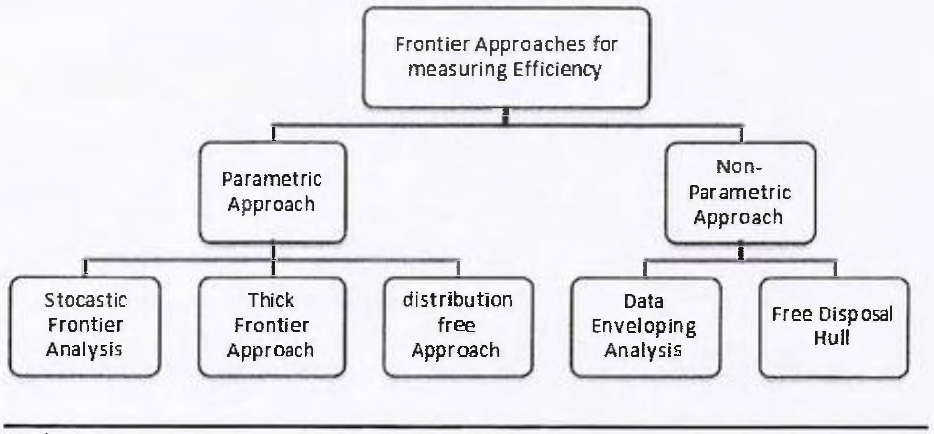


Figure 2.7
frontier approaches for measuring efficiencies
Source: (Kumar & Gulati, 2008)

As it is observed from the above figure that both parametric and non-parametric method are applied by the different approaches. These approaches are explained in the following sub-sections.

2.4.1 The Parametric Approach

Parametric approaches are able to identify the functional relationship among the variable like cost, profit, in between the output and input, and in between the output and other factors. This implicitly considers the identification of production process and also consistent with the functional form of the production process which is explained as by Cummins and VanDerhei (1979) "consistent with the organization of production at the firm". Stochastic term is the part of that process and is divided into inefficiency and random error. However, these approaches have different assumptions about the nature of distribution and the error or stochastic term.

2.4.1.1 The econometric or Stochastic Frontier Approach (SFA)

The Stochastic Frontier Approach (SFA) is generally used by most of the researchers among the parametric approach. The philosophy of this approach is constructed on the assumption of minimizing the cost per unit (Greene, 1990). It also has a specific assumption about the distribution of the two components of error term, i.e., random term follows the symmetric distribution whereas part of inefficiencies follows the asymmetrical distribution (Berger & DeYoung, 1997; Cummins & Weiss, 1993; Yuengert, 1993). Yuengert (1993) tried to examine the flexibility of the distribution of inefficiencies but it becomes more problematic when both distributions are behaving in a closely manner.

2.4.1.2 The Distribution-Free Approach (DFA)

This approach is different from SFA because in this approach both of the categories of random terms are separate with each other, i.e. inefficiency from random error. DFA has no restriction on the distribution of both of these categories (Berger et al., 1993). This approach assumes that with the passage of time the distribution of relative efficiencies becomes stable and the average of error term tends to zero. However, efficiencies can be influenced by the technological change or change in the regulatory regimes. Consequently the assumption of stability of relative efficiencies may not be hold (Gardner & Grace, 1993).

2.4.1.3 The Thick Frontier Approach (TFA)

This approach measures the efficiency on the basis of the quartiles of the cost functions, i.e., highest performance cost quartiles and lowest performance cost quartiles. Highest and lowest performance cost quartiles are estimated based on stratified size class. (Bauer et al., 1998; Yuengert, 1993) So, one can simply say that deviations within quartile exist for inefficiencies and between quartiles for random error term.

2.4.2 Non-Parametric Approach

This is the specific character of non-parametric approach that it is not based on any particular and certain functional form. Thus, researcher does not need to know the whole working process of understudy business organization. This approach is very much practicable, it does not need to build a model with some prior assumptions for his production function, instead of that researcher's model is based on the real observations and on the basis of that it is estimating the best performing function. Generally, two non-parametric approaches are used for measuring the efficiency scores, i.e. Data Envelopment Analysis (DEA) and Free Disposal Hull (FDH). Their details are given in the following sub-sections.

2.4.2.1 Data Envelopment Analysis (DEA)

Farrell (1957) developed a mathematical model in 1957 by using single input-output technique for the measurement of technical efficiency. But the Data Envelopment Approach (DEA) based on mathematical programming was introduced by Charnes, Cooper, and Rhodes (1978), later on known as CCR model. This model was developed

for measuring the relative efficiency and taking the set of decision-making units (DMU) and having the identical set of input and output variables. After 1978, a number of studies used DEA and a number of development, a significant improvements, a lot of extensions, refinements were appeared in the original model of CCR (Seiford, 1996).

However in 1984 Banker et al. (1984) made a remarkable development in the CCR model, i.e. the CCR were extended without the assumption of constant return to scale. This model was known as BCC model. In this new version efficiency can be measured without the "units of scale of operation". It is also interesting to note that BCC model separately measures the technical efficiency whereas CCR gives the aggregate measure of technical and scale efficiency. Which is the major development of the DEA technique.

DEA as a technique is based on the linear programming. It is applying for searching that decision making unit (DMU) which shows the best practice performance, i.e. same inputs but more output or same output with the less units of input (Berger & Humphrey, 1997). DEA has an advantage over the ratio analysis and also its results are more reliable and valid than the parametric approaches which we have mentioned previously. Another additional advantage is that it deals with the multiple inputs and outputs while it measures the efficiency, not like ratio analysis which measures efficiency with only single input and single output whereas parametric approaches are measuring efficiency which is based on the single independent variable. Moreover, DEA is able to provide more details about the relative performance of the firms within the industry (Cummins & Turchetti, 1996; Fecher, Kessler, Perelman, & Pestieau, 1993)

A number of studies discussed in detail about the methodology and its further developments. Among them Fried, Schmidt, and Lovell (1993), Charnes, Cooper, Lewin, and Seiford (1994) are more prominent. Fried et al. (1993) discussed about the production function and productive efficiency under the umbrella of econometrics and mathematical programming. They also discussed the derivation of different formats of the model and their applications. On the other side (Charnes et al., 1994) concentrated on the approach of mathematical programming and also their focus was to derive the basic model of DEA. They conducted an extensive research on the different aspects of the DEA model. They theoretically developed and modified the model of DEA and simultaneously they empirically test what they have been developed and also developed by the other studies. Their range of their work is a marvelous one, they estimated the technical efficiency for the Swedish Dairy farms and the productivity growth of Norwegian economy (Forsund, 1993; Kumbhakar & Hjalmarsson, 1991).

2.4.2.2 Free Disposal Hull Frontier

Generally, it is claimed that DMUs in the DEA approach are not based on any unrealistic assumptions or not based on any imaginary state. It is believed that values which researchers considering they are actually observed. (Deprins, Simar, & Tulkens, 1984) suggested a staircase function which shows the real observations of inputs and outputs. According to Cooper et al. (2007) that this is unit variant, not considering the slacks, and only considers the weak efficiency whereas slacks are assumed to be on "Free Disposal".

According to Berger et al. (1993), most of the studies measured the efficiency of this sector by using the cost frontier approach and among these frontier approaches, Data

Envelopment Analysis (DEA) is mostly used by the researchers. However, parametric approach has some strengths and limitations which are defined in the next section.

2.4.3 Limitations and Strengths of Frontier Approaches

The parametric approach has some limitations and strengths. The limitations of the parametric approach are as under.

1. The relationship between the inputs and outputs is determined by only one independent variable. So, the efficiencies are measured "for single input-multiple output scenarios or single output-multiple input scenario." It means that one cannot observe bigger scenario.
2. Another issue is related to the measurement of the performance of the best performance" with the parametric approach. Because this approach measures the central tendency, for example the application of OLS gives an average result. Keeping that in view it is not possible to identify the best practice performance firm.

Whereas the DEA method, as a non-parametric technique, has some strengths which make it feasible for use in the data, where the prices of the data are unknown. The strength of the parametric approach (DEA) are as under.

a) DEA permits the analysis of small size of population; it is especially useful when the sample size is limited, as Pakistan's *takaful* and insurance industry fulfills this condition, so it is feasible from the researcher's point of view to apply this technique for the empirical testing of the hypothesis of this study. Other parametric methods, such as SFA, DFA and TFA, require large sample sizes in order to obtain better or more degrees of freedom for valid results.

b) DEA identifies units that achieve the best results. This technique allows for the examination of best performance and their best practices and gives the efficiency score for each unit. It gives information on how each different firms perform. Hence, the DEA solution is unique for each DMU under investigation, which allows a direct comparison to be made against a peer or a combination of peers.

2.5 Literature on Efficiency

According to Coase (1937), efficiency is the process of the firm to maximize its output within the given limited inputs. Technical efficiency is being calculated by the frontier method. Efficiency is an input output equation. Firms which consume less inputs to produce maximum outputs are considered to be Efficient firms. The two different method are being used to calculate the efficiency of the financial sector. These are parametric and non-parametric approach. Cummins and Weiss (2013) reviewed the studies of insurance sector and found that 60% studies (44 out of 74) used DEA method to evaluate the efficiency of the insurance sector and the remaining studies used the rest of the above-mentioned techniques. Among them studies measured the efficiency of the insurance sector are reviewed below.

Some of the researchers measured the efficiency of the insurance industry for the developing countries like U.S and European countries. Fecher et al. (1993) estimated the efficiency of life and non-life insurance companies of France, sample size was 327 (84 life, and 243 non-life) and 1984-89 was sample period. They construct the frontier through parametric (SFA) and non-Parametric (DEA) approaches for measuring the efficiency. According their estimations efficiency of non-life insurance companies (50%) was higher than the life insurance companies (30%). Cummins and Turchetti

(1996) also estimated the efficiency and growth in the productivity for the Italian insurance firms through the production frontier by applying parametric (SFA) approach with Malmquist indexes for 94 firms from 1985-93. The study concluded the steady improve in efficiency and 25% decrease in productivity for the industry. Hardwick (1997) estimated the impact of liberalization on the state of technology of the EU financial services market and the sample period was 1989-1993. The study used the SFA technique to measure the efficiency and reported the 30% inefficiencies for the insurance sector of United Kingdom.

Fuentes, Grifell-Tatjé, and Perelman (2001) analyzed the efficiency and measured the impact of deregulations on the insurance industry of Spain from 1987-1994. They observed that there was insignificant impact on the technical change and efficiency during this period. Another study by Noulas, Lazaridis, Hatzigayios, and Lyroudi (2001) measured the efficiency of Greece insurers for 1991 to 1996 using the DEA method. They found that the firms are inefficient because they were working under 35% than their optimum capacity. Cummins and Rubio Misas (2001) measure the efficiency and productivity for the Spanish insurance industry from 1989-1998 by using DEA method. The reported that technical efficiency remain 60% and factor productivity increased by 2.6% for the under-study period.

Worthington and Hurley (2002) measured the efficiency for Australian insurance sector for 1998 by employing DEA technique. They found that insurance firms were only 55% efficient for the study period. Mahlberg and Url (2003) also calculated the level of efficiency and productivity of Australian market from 1992-1996 by using DEA and reported the technical inefficiencies for the insurance sector. Barros, Barroso, and Borges (2005) estimated the efficiency and productivity change by using DEA for the

insurance industry of Portuguese. The results show the mix trends in the market. Some companies improve the efficiency change whereas some of them face the decrease in efficiency change over the specified period.

The average cost efficiency of 781 property and liability of US insurance companies were examined by Cummins and Xie (2013) and they used DEA technique and Malmquist Index approach. They found that the average cost efficiency is 51% from 1993 to 2009. Their results depicted that productivity was improved during the period of study whereas the efficiency results show that most of the firms operating with decreasing return to scale.

Some studies are also available on other economies including the China and Thailand. Chen, Powers, and Qiu (2009) compared the efficiency of the domestic and foreign insurance firms operating in china for the period of 2001-2007 by DEA technique. Their result shows that the foreign companies are more efficient as compare to the domestic companies. Hu, Zhang, Hu, and Zhu (2009) also studied the efficiency of the insurance sector in china over the period of 1999 to 2004 by the same DEA technique. They reported the mix trend for efficiencies. The efficiency increased from 2000 to 2003 and then decrease in 2004.

Hsu and Petchsakulwong (2010) estimated the relationship between corporate governance and efficiency of insurance companies of Thailand from 2000-2007 and used DEA for estimating the technical, cost, allocative and revenue efficiencies. They concluded that inside ownership and outside directors have significant positive impact upon efficiency. The efficiency and productivity of twenty five Taiwanese life insurance companies in 2010 was studied by Lin (2012). He classified the whole sector

in to four classes. It was interesting to note that companies with high product efficiency have low profit and vice versa.

Barros and Wanke (2014) examined the technical efficient and capacity issues of the five insurance companies of Mozambique from 2002 to 2011. They used DEA bootstrapped technique. They considered that market share, ownership type and firm origin had the impact on the efficiency of the insurance firms. They found there is capacity shortfall and also reinsurance is not working efficiently in Mozambique. Alhassan et al. (2015) examined the effect of efficiency and market structure on the profitability of life as well as non-life insurance companies of Ghana. They applied DEA approach for their empirical investigations. Their results followed the efficient-structure hypothesis. They concluded that profitability is positively related with the efficiency. They also found that life market is more concentrated and efficient than the non-life market.

Some researchers made a cross country study to estimate the efficiency of the insurance sector in multiple countries. Rai (1996) estimated the efficiency of the insurance companies (life and non-life) of eleven countries including nine European countries, japan and U.S from 1988-92. He measured the X-efficiency by using the SFA. However, result shows that small size of the firms is more efficient and also specialization increases the degree of efficiency. However, the steady efficiency was observed when he applied SFA model. Hussels and Ward (2007) examined the performance of 78 German and UK insurance firms covering the period 1991-2002 by using both DEA and SFA technique. They concluded that German firms are more efficient than UK firms during the study period. Luhnen (2009) studied the efficiency of German property and liability market by applying DEA approach. Sample size was

148 from 1995-2006. He found that specialized insurers are more efficient. Leverage has positive relation with efficiency whereas large premium growing firms are less efficient.

Eling and Luhnen (2010a) studied the behavior ofInsurance market for a larger group of thirty-six countries for the period 2002 to 2006. They used both the Parametric and non-Parametric approaches. The results showed that there is steady growth all over the world but with large variance among the countries. They found that mutual firms are less efficient than stock firms. However, they concluded that by using the different types of distributions and methodologies have insignificant impact on the degree of efficiency.

Bertoni and Croce (2011) examined the productivity of a panel of life insurance companies of Germany, France, Italy, Spain and UK between 1997 and 2004. The DEA technique and Malmquist productivity index is used. They used one output ("net premium") and four inputs ("equity, total other liabilities, net technical reserves, total operating and management expenses"). The study concluded that increase in productivity is due to the innovation and use of best technology. The efficiency of thirty nine insurance companies of GCC countries were examined by Al-Amri et al. (2012). It is interesting to note that they selected only four companies from Saudi Arabia. They analyzed the panel data from 2005 to 2007. They applied DEA and Malmquist index and found that insurance companies in the GCC countries are moderately efficient.

Huang and Eling (2013) analyzed the behavior of the insurance companies of Brazil, Russia, India and China (BRIC Economies). For the determination of efficiency of the insurance sector they applied the Simar and Wilson's multi stage DEA approach. They

found that equity, size, profitability and type of ownership determined the degree of efficiency. In the country wise analysis, they found that India is less efficient in terms of technical efficiency, Brazil is the most efficient in the non-life insurance industry, whereas China is less efficient. The difference between China and India was less significant. Four factors such as log of total assets, return on equity, ratio of equity capital to total assets, and independent ownership structure increased the explanatory power of the function.

Alhassan and Biekpe (2015) examined the pattern of the efficiency and productivity of non-life insurance industry of South Africa from 2007 to 2012. This study used non-parametric DEA approach for the measurement of efficiency and return to scale. Malmquist analysis is also applied for measuring the growth of the productivity for the sample period. They found that there is high technical inefficiency and growth in productivity is due to the advancement in the technology. Procedure of Simar and Wilson (truncated bootstrapped regression) is applied for the determinants of efficiency of the insurance firms. They found that size, reinsurance, leverage, product line diversification and size has impact on the efficiency of the firms

Grmanová (2016) calculated the technical efficiency for the insurance industry of Slovak Republic by applying the Data Envelopment Analysis. Study used the input oriented variable return to scale (VRS) technique to measure the efficiency score. Claims incurred and operational costs are used as input whereas premiums & revenues from financial investments are used as output. Study used the tobit regression in second stage to calculate the impact of the firm size on the efficiency of insurance firms. The number of insurance contracts and employees are used as an indicator for the size of the firms. The results indicated that number of insurance contracts is positively

significant related to the efficiency whereas number of employees is not significant related to the efficiency score. However, the study is only limited to the data of one year which could be more valuable if the data is expanded for the time period and some more variable are included to measure the determinants of efficiency.

After discussing the studies for the measurement of efficiency for the insurance industry, it is pertinent to discuss the available literature on the *takaful* industry. In the following section the studies related to *takaful* (Islamic insurance) the counter part of the insurance is presented.

2.5.1 Efficiency of *Takaful* Firms

Takaful is established in 1979 and it is a new industry as compared to the conventional insurance market. It is difficult to find enough studies which measure the efficiency of the *takaful* firms. However, the available literature on measuring the efficiency of *takaful* industry is reviewed here.

Kader, Adams, and Hardwick (2010) using DEA for evaluating the cost efficiency of 26 non-life *takaful* firms from the sample of 10 Islamic countries. For the determinants of cost efficiency, they applied second stage regression. According to their findings size of firm, size of the board, product diversity, ownership concentration and specialization have positive significant association with the cost efficiency and corporate governance. However, they did not discuss the counterpart of the *takaful* (insurance companies) in their analysis. Cost efficiency score was 0.70 and no economies of scope was found because of the nature of the *takaful* business, i.e. cost efficiency is related to specialization instead of diversification.

Miniaoui and Chaibi (2014) presented a comparative analysis of GCC countries and Malaysia, from 20006 to 2009. They selected 12 *takaful* operators (three from UAE, two from Qatar, two from Saudi Arabia, one from Bahrain, and four from Malaysia). They applied DEA with both constant return to scale (CRS) and Variable Return to Scale (VRS) assumptions. They used Mann Whitney test for empirical analysis. They focused on the technical efficiency of the *takaful* sector for both regions (GCC and Malaysia). They found GCC market is more efficient than Malaysia. These findings also confirmed the findings of Ernst & Young annual report, 2010.

Amri et al. (2014) analyzed the scope of economies, organization structure and insolvency risk of *takaful* industry. They selected 19 Muslim countries, i.e. Egypt, Libya, Mauritania, Senegal, Sudan, Bangladesh, Pakistan, Sri Lanka, Brunei, Indonesia, Malaysia, Singapore, Thailand, Bahrain, Kuwait, Qatar, Saudi Arabia, UAE, Jordan, Lebanon, Yemen, Syria, Turkey, Palestine and Iran. DEA is applied for measuring the efficiency and insolvency risk is measured through distance to default. The study reported the negative relationship between insolvency risk and efficiency of the *takaful* operators.

Some studies have been conducted on both insurance and takaful industry at the same time. In the following sub-section, literature regarding the comparison between the insurance and *takaful* efficiency measurement is presented

2.5.2 Efficiency of *Takaful* and Insurance Firms

Takaful and insurance are working on the same grounds and their functions are to hedge the risk and provide the protection against the catastrophe. Although *takaful* is an infant industry and does not offering its services all over the world as compared to

conventional insurance. However, despite of this, still *takaful* industry is trying to compete the established conventional insurance industry. Especially in the Muslim countries where dual system is operating, it provides an interesting opportunity to the researchers to examine and compare the efficiency of both of them. However, only few studies are available in the current literature presenting the comparative analysis of the state of efficiency of *takaful* and conventional insurance. The review of these studies is presented here.

Saad, Majid, Yusof, Duasa, and Rahman (2006) examined the life insurance industry in Malaysia, their sample period was 2002-2005, and they used panel data of 13 insurance companies. They studied both Islamic and conventional insurance firms. DEA was applied for measuring the efficiency. They used Malmquist index to calculate efficiency change including pure efficiency, scale efficiency and technical change index. According to their findings, from the perspective of productivity, *Takaful* National was below average and from the perspective of technical change *Takaful* National was slightly above average. And on the other hand, it was below average in case of efficiency and pure efficiency change.

Ismail, Alhabshi, and Bacha (2011) analyzed the dual financial system of Malaysia, sample size was 19 firms and sample period were 2004 to 2009. DEA is used for measuring the technical efficiency of both markets, i.e. conventional and Islamic. They used CRS and VRS for the scale and technical efficiency. The degree of technical and scale efficiency is higher in the conventional firms as comparative to the *takaful* firms. They concluded that the organizational structure has a significant impact on the efficiency of the insurance firms in Malaysia.

Yakob, Yusop, Radam, and Ismail (2011) studied the efficiency of risk management of life insurers and *takaful* operators in Malaysia. There is a dual financial system and environment is a competitive one. In the current literature one cannot find many studies based on risk management efficiency of life insurance and same to *takaful* industry. DEA was used for obtaining the efficiency score of risk management. It has been observed the efficiency score of both types of companies are reasonably high whereas dispersion showed decreasing trend. The association between efficiency of risk management and firm size was not observed, however association in between the organizational structure of the insurance firms and efficiency score of risk management was quite high.

Md Saad (2012) examined the efficiency of conventional and Islamic insurance companies in Malaysia by using DEA. His sample size was 28 firms (conventional and Islamic Companies) while sample period was 2007-2009. He has taken premium and net investment income and commission and management expenses as input. Total factor productivity also has been measured using the MPI. Conventional firms are found more efficient in the study period. Out of six, only one takaful operator showed the more productivity change for the study period. The inefficiency in TFP was due to innovation in technical components.

Abduh et al. (2012) used the ratio analysis and DEA for estimating the performance and efficiency of twelve insurance and *takaful* companies operating in Malaysia. In DEA, premium and net investment income are used as output. Whereas commission and management expenses are taken as inputs. The finding reflects that the insurance sector is more efficient as compared to the *takaful* firms operating in Malaysia under both the ratio analysis and data envelopment analysis.

Singh and Zahran (2013) estimated the cost efficiency of both types of the insurance companies for the eight MENA countries, i.e. Bahrain, Egypt, Jordan, Kuwait, Qatar, Saudi Arabia and Tunisia. Data were collected from 32 insurance companies, SFA, DEA and PFA were used for the empirical analysis. They concluded that *takaful* companies are less efficient due to *Shari'ah* compliant products. The shariah restriction (can invest only in shariah compliant products) imposed only on *takaful* operators render them less efficient investors than of insurance sector.

This study is trying to evaluate the efficiency of the Pakistan's insurance and *takaful* sector and an attempt to compare the efficiency of *takaful* and insurance firms. For the comparative analysis it is necessary to review those studies which has already been conducted on the efficiency of Pakistan's insurance/*takaful* sector.

2.5.3 Efficiency of Insurance/*Takaful* in Pakistan

Pakistan's insurance industry was not well established before 2000. The growth of insurance industry was observed in Pakistan because of the new regulation approved by the government in 2000. *Takaful* firms were established in Pakistan after the approval of"*Takaful* rules 2005".*Takaful* firms have started their business from 2006 in Pakistan, therefore, the research on this area is not very much fertile. Even the number of studies is not quite enough but the research conducted in this field has its own significant. Studies of the *takaful* and insurance sector of Pakistan are discussed below.

Asghar and Afza (2010) estimated the efficiency of the insurance sector of Pakistan over the period of2003-2007. The study used the Data Envelopment Analysis (DEA) to estimate the technical efficiency, allocative efficiency and cost efficiency of the

insurance companies. Technical efficiency, allocative efficiency and cost efficiency of the insurance firms were 92.7 %, 81.12% and 75.44% respectively. Technical efficiency was increased in the estimated period whereas allocative and cost efficiencies were initially increased from 2003 to 2005 and then decreased in 2006.

Another study is conducted by Khan and Noreen (2014) covering the period from 2006 to 2010. They examined the efficiency of both types of insurance companies, i.e. conventional and Islamic insurance companies. They measured the technical, cost and allocative efficiencies by using the DEA approach and identified the both types of inefficiencies, i.e. allocative and cost. However, the industry found to be technical efficient for the study period.

Awan and Iqbal (2015) calculated the efficiency of the insurance industry of Pakistan over the period of 2002-2007. They estimated the technical, pure technical, scale and mix efficiencies of 25 general insurance companies of Pakistan. Both the constant return to scale (CRS) and variable return to scale (VRS) techniques of Data Envelopment Analysis are being used to measure the efficiencies. They concluded that insurance sector is working inefficiently due to the excessive labor and delayed settlement of the claim amounts.

Janjua and Akmal (2015) compared the efficiency of the both types of insurance (conventional and Islamic) companies operating in the Pakistan over the period of 2006-2011. They employed the Data envelope Analysis (DEA) to calculate the allocative and cost efficiency and concluded that *takaful* operator are more efficient for the study period.

Noreen and Ahmad (2016) calculated the efficiency of 12 largest insurance companies for the period of 2000-2009. They applied the Data Envelopment Analysis (DEA) to calculate the efficiency and then used Malmquist Index to calculate the total factor productivity of the insurance firms. The results show that the insurance sector of Pakistan is technically efficient but allocative inefficient.

A brief literature survey suggest that number of studies have been conducted to calculate the efficiency of the insurance sector for the developed countries including Bertoni and Croce (2011); Cummins and Xie (2013). Some studies tried to calculate the efficiency of the insurance sector for the developing countries like Al-Amri et al. (2012); Alhassan and Biekpe (2015); Grmanová (2016); Hsu and Petchsakulwong (2010). Some efforts have been made to calculate the efficiency of the *takaful* firms for single and multiple countries including Malaysia, Indonesia, GCC countries, Mena region and other Muslim countries. A few studies including Abduh et al. (2012); Md Saad (2012); Singh and Zahran (2013); Yakob et al. (2011) compared the efficiencies of insurance and *takaful* sector. A little literature is also available on Pakistan market. The studies including Asghar and Afza (2010); Awan and Iqbal (2015); Noreen and Ahmad (2016) calculated the efficiencies only for the insurance sector and used the data before 2009. The two studies Khan and Noreen (2014) and Janjua and Akmal (2015) tried to compare the efficiencies of the insurance and *takaful* sector but Janjua and Akmal (2015) calculated the allocative and cost efficiencies of the industry and Khan and Noreen (2014) calculated the technical, allocative and cost efficiencies of the industry. They also used the data for the period of 2006 till 2011 whereas it is already mentioned that *takaful* operators started their business in just 2006. These studies also did not calculate the pure technical efficiency and scale efficiency of the insurance and

takaful industry. No attempt has been made to measure the firm-level attributes which determine the efficiency of insurance and *takaful* sector of Pakistan. This study will use the two-stage analysis approach. In the first stage, the efficiency of the *takaful* and insurance industry of Pakistan will be measured by using the inputs and outputs and the determinants of the efficiency will be measured in the second stage. However, the key determinants of the efficiency will be discussed in the following section.

2.6 Determinants of Efficiency

The identification of the factors that explains differences in efficiency is critical for taming the efficiency of financial institutions although, unfortunately, there is no theory defining the exact determinants of efficiency (Aggrey, Eliab, & Joseph, 2010). For financial institutions, few analyses on efficiency have been instructive in identifying exogenous determinants of efficiency (Berger & Humphrey, 1997). In addition to this, the limited knowledge of basic determinants of efficiency of insurance industry in developing countries worsens the situation (Olson & Zoubi, 2011). Thus, the variables are chosen based on their previous empirical success.

This study advances a number of hypotheses like firm size, market share, profitability, Leverage and the mode (Islamic or conventional) to test their relationships with efficiency.

2.6.1 Size (log of total assets)

Size is a log of total assets of the insurance and *takaful* operators. Some of the studies have been conducted to measure the impact of the asset size on the efficiency of the insurer industry. Cummins and Rubio Misas (2001) along with (Hao & Chou, 2005;

Luhnen, 2009; Mahlberg & Url, 2003) argued that firms with a larger slze collect are profitable and collect more revenue i.e. they are more efficient than firms with a smaller slze. This is the reason that, large sized lnsurers are more llkely to benefit from economies of scope and scale ln the fonn of less per unit cost of production attained from large-scale productlon. Most of the study argued that asset slze has positive lmpact upon the efficiency. They explained wlth the argument that insurer wlth larger asset slze have scale advantages. Larger Scale reduce the cost of per unit production when volume of the output is lncreased. By thls phenomenon, the fixed productlon cost is spread over the large number of outputs including infra structure, IT equipment and financial capital etc. Cummlns and Rubio-Misas (2006) argued that scale economies have positive effect on the managerial skills. It ls also assumed that large scale benefit ln the reduction of income volatlllty. A number of past studies including (Cummins & Zl, 1998; Eling & Luhnen, 2010a; Luhnen, 2009) for the insurance sector and (Ismail, Shabri Abd. Majid, & Rahim, 2013); Noor and Ahmad (2012) for the banking sector reported the posltlve relatlon between Asset Slze and efficiency.

Some studies (e.g. (Fenn et al., 2008)) make the argument that diseconomies of scale suffer the larger firms as compare to the small firms due to the complexity. So, in this case mlddle sized firms found to be more efficlent rather the larger firms. Some studies includlng (Diacon, Starkey, & O'Brlen, 2002) found that large and small firms are more efficient as compare to the middle-slzed insurers. There is a u-shaped trend been reported among the large, middle sized and small firms. Zanghleri (2009) reported the mix nonllnear relatlonshlp between the efficlency and the asset size for the insurance sector. The study reported the posltive relationship for llfe insurer means middle sized are more efficient as compare to large and small firms. Whereas Yuengert (1993)

reported the insignificant relationship between the asset size and efficiency of the insurance firms. On the other hand, the limitations of larger firms to monitor and regulate the activities of large-scale operations which results in diseconomies of scale, hence, a negative relationship. Noreen and Ahmad (2016) also found that larger firms failed to produce low cost output so size has negative relation with the efficiency of a firm. (Rai, 1996) also reported that large insurer are less efficient than small insurers for swiss insurance industry. Some of the studies also calculate the relationship of asset size and efficiency for the other financial institutes including (Darrat, Topuz, & Yousef, 2002; Gishkori & Ullah, 2013; Ismail et al., 2013; Jha, Hui, & Sun, 2013) and found the different and contradictory results.

The different results under the different economies of the world have been reported by the researchers between asset size and efficiency of the financial firms and these studies are conducted in different time span where the economic situation of the economies was not same. Therefore, no unique relationship has been identified by the researchers between firm size and efficiency.

2.6.2 Market Share (ratio of premium of each firm to total premiums)

The rationale behind the relation between efficiency and Market Structure was first introduced by Hicks (1935) who discussed that monopoly powers relief the managers from a competition. This allows them to adjust their share of monopoly rents through discretionary expenses or reduce their efforts. Gardner and Grace (1993) and Ryan Jr and Schellhorn (2000) used market share to account for the market power of the firm and examined the relationship between market share and cost efficiency. This study

includes the market share variable to control the possibility of market power and test the effect of the market share on efficiency.

Firms with higher market shares are expected to get the benefit of cost sharing and less per unit expenses of electronic equipment and buildings. They also are able to lower production cost per policy to a greater degree as compare to the firms with small market shares. Previous studies by Fenn et al. (2008) and Ansah-Adu et al. (2011) described that market share (MS) variable is positively significant reflecting that a higher market share of a firm leads to higher efficiency and vice versa. Epermanis and Harrington (2006) reported that growth in market share also can be attained by consuming the higher operating expense which suffer the output cost and impact the efficiency negatively. Sometime the target to increase in market share and financial rating influence the decision of management, negative effect the technical and cost efficiency of the firm. If insurance firms continued to increase their premium growth, proper underwriting process may be abandoned which leads to increased chance adverse selection. Luhnen (2009) also reported the negative relation between premium growth and efficiency for the German insurers. Yuengert (1993) and Cummins and Zi (1998) also reported that the mega-insurers with significant market share are characterized by decreasing returns to scale and thus likely to be cost inefficient. The above-mentioned studies describe the relation between Market Share (MS) and efficiency and produces the contradictory results.

The relationship between market share and efficiency of the insurance companies has been investigated by several studies including (Lehmann, Warning, & Weigand, 2004) and (Tregenna, 2009). Fewer studies have been conducted for the insurance sector including (Choi & Weiss, 2005; Fenn et al., 2008; Luhnen, 2009; Weiss & Choi, 2008).

However, in spite of the studies on the relationship of the variable market share and efficiency of insurance sector of some developed and developing countries, no study has been documented in the context comparison of insurance and *takaful* sector of Pakistan.

2.6.3 Profitability (ROE)

Profitability is considered as a set of financial metrics utilized in the assessment of the business's ability to produce earnings as opposed to expenses and other relevant costs in a particular duration of time. When a company has a higher value of ratio compared to its competitors or compared to the same ratio of a past duration of time, it is considered to be performing well.

The analysis of the relation between efficiency and profitability is persuasive for the industry. Profitability of a firm and especially an insurer is of supreme importance to its operations. For the viability of a firm, the regulators and stakeholders rely on profitability ratio. If insurer viability is at risk, they can seize the operation or any other actions to improve the deficiency in capital. Because of the scrutiny of both net income and equity, the profitability of the insurer determines to large extent its ability to invest and grow. The profitability (ROE) has a positive effect on the efficiency of firms. Ismail et. al (2011) and Afza and Asghar (2012) support this assumption that the efficient firms earning more profit and vice versa and they found positive relationship between efficiency and the profitability of the insurance companies.

On the other hand, it has been argued that profitability may affect efficiency negatively. According to El Moussawi and Obeid (2011), in a competitive market, financial institutions can select a different marketing strategy which force them to prevent high

profitability policy or these institutions adopt lessor incentive policy to improve production efficiency as compare to other competitive. Some researchers reported the negative relation between efficiency and profitability over the years for the financial sector. Ataullah and Le (2006) and Casu and Girardone (2004) found that profitability affected efficiency negatively.

The relationship between profitability and efficiency of the insurance companies has been investigated by several studies in both developed and developing countries including (Liebenberg, 2000; Oscar Akotey & Abor, 2013). Ismail (2013) investigated the relation of profitability and efficiency for insurance and *takaful* sector of Malaysia whereas Afza and Asghar (2012) investigated the impact of financial reform on the profitability of the insurance sector of Pakistan. However, the relationship between profitability and the efficiency for the *takaful* and insurance sector has not been documented in the context of Pakistan.

2.6.4 Leverage (equity to Asset) Ratio

The leverage (Equity to Asset) ratio is a proxy used to examine the impact of credit risk on the efficiency of the financial institutes. Financial leverage includes the amount of borrowing and liability relative to the amount of capital and assets (Kwan & Eisenbeis, 1997). The increased security level is directly connected with higher equity capital holdings of insurance firms comes at the expense of costly equity capital. Equity is the input for the measurement of efficiency, increase in equity resulted the decrease in leverage ratio (i.e. equity to asset ratio) ceteris paribus tends to a reduction in productivity. There is another argument that in long run, increase in security level (equity) resulted in premium volume because of decreased insolvency risk (Epermanis

& Harrington, 2006). On the other hand, (Cummins & Nini, 2002) argued oppositely insurer over utilized equity which significantly consume revenue and capital penalties resulted as a cost inefficiency.

The leverage variable is used in the previous studies for financial institutions. Dagogo and Okorie (2014) measured the effect of leverage, profitability and efficiency of the Nigerian banking system. They found that leverage and profitability has significant association with the efficiency of the Nigerian banking system. Pushner (1995) estimated the efficiency, leverage and its determinant for the Japanese financial system and found the negative significant association between leverage and the efficiency and productivity for the Japanese financial system respectively. Hailu, Jeffrey, and Goddard (2007) also found the financial leverage significantly and negatively related to the cost efficiency for the agribusiness firms in Canada. Alhassan and Biekpe (2015) and Foong and Idris (2012) found the significant relation between the leverage and profitability of the life insurance firms operating at constant return to scale in south Africa and Malaysia respectively.

Biener et al. (2016) and Luhnen (2009) also found the significant and negative relation between leverage and efficiency of the insurance industry. These results are also consistent with the agency theory which states that agency costs due to conflicts of interests increase with the level of debt (Jensen & Meckling, 1976). Altunbas, Carbo, Gardener, and Molyneux (2007) elaborate the relationship between efficiency, capital, risk and moral hazard. It is argued that efficiency and capital and efficiency are relevant determinants of moral hazard incentives and risk-taking (Miah & Sharmeen, 2015). The empirical evidence thus does not point to a definite trend in either direction.

Number of studies have described the relationship of leverage and the efficiency of the financial sector including (Altunbas et al., 2007; Dagogo & Okorie, 2014; Kwan & Eisenbeis, 1997). Some researchers tested the relationship for insurance sector particularly including (Alhassan & Biekpe, 2015; Biener et al., 2016; Foong & Idris, 2012; Miah & Sharmeen, 2015) but there is no study available which simultaneously tested the relationship of leverage and efficiency for *takaful* and insurance industry with the context of Pakistan.

2.7 Underlying Theories

The aim of this section is to provide the theoretical foundations of this study for the developing the more understanding of the under-study subject. These theories are as follow:

2.7.1 Theory of Firm

The theory of the firm is a branch of micro economics, which address the supply of goods by profit-maximizing agents. Jensen and Meckling (1976) defines that the basic objective of the firm is to maximize its profit. All of the planning and strategies are formulating on the basis of this objective. This is the main target of each and every firm being the ultimate demand of the shareholders. This is the scale where one can measure the efficiency of the firm. For the achievement of this goal firms are trying to maximize the sale revenues, minimizing the per unit cost, applying the most advance technology and using the best optimal strategies.

Coase (1937) was the first scholar who developed the modern concept of the modern firm and introduced the theory of firm in 1937. Later on Oliver Williamson an

institutional economist further developed Coase's theory of the firm trough a deeper analysis of different forms of contracts and became commonly known as theory of transaction-cost or more broadly the economics of organization (Williamson, 1985). Williamson developed governance structures which can be seen as a spectrum of contracts between the extremes of Coase's market versus firm analysis (Braendle, 2017).

Coase (1937) pointed out that transection cost should also be included in production cost while explaining the firm. He explained the process of the firm to maximize the output for maximization of profit with the given limited inputs (efficiency measurement). According to Coase the transaction costs explain the optimal size of the firm (scale efficiency) and its existence. Whereas Ascarya and Yumanita (2009) define the above process that technical efficiency measurement is often limiting itself to technical and operational relation in conversion process of input into output.

The management through its past experience is able to reduce the per unit cost of the firm and realizes that how to increase the level of output as well as the best level of productivity and efficiency. In the short-run firms can observe the losses and waiting for the bright future but in the long run firms can only survive if they are competitive and earning the normal profit. However under the monopoly they can wait for a certain period and change their technology as well as their strategies (Cummins & Xie, 2013).

On the hasis of theoretical foundations, the above-mentioned phenomenon is similar to the financial institutions. They are also trying to achieve the target of maximum profit. Because these firms are accountable to their shareholders, so they want to become more productive and efficient in the relative terms. In this advance age of information

technology all of the shareholders to some extent have the maximum knowledge about the financial market. The portfolio of shareholders/investors is dependent on the information which is provided by the firms. They have a deep eye on the performance, efficiency and productivity of the firms. Keeping that in view, the financial firms are facilitating their staff and providing them the different opportunities for enhancing their abilities and capacities. Most of the staff members are well specialized in the specific tasks. Similarly, the insurance companies cannot live in the cocoon. And they are also following the business norms of the financial market. Their management is always trying to reduce the cost per unit and putting their efforts to increase premium collected. Most of the insurance companies are trying to reduce the risk through the large volume of "insurance premium pools collected" and, they are diversifying their investment. In this way insurance companies are avoiding the higher degree of their risk of losses.

2.7.2 Agency Theory

In the recent past the agency theory received a lot of attention among the different discipline of knowledge, i.e. management, corporate finance and organizational behavior. It is a well-known phenomenon that there is conflict of interest in between the management and principal. The contract structure of organizations separating ownership from control gives rise to agency problems resulting from the fact that the agents or managers do not bear the risks or the "wealth effects of their decisions" (Fama & Jensen, 1983a, 1983b).

Due to this conflict the agency cost creates an unpleasant environment in the firm. A number of cases the decisions of the mangers are not appreciated by the shareholders. No doubt shareholders are always expecting that management should protect their

interests. Management's role is very crucial in the decision-making process of the firms and organizations. Especially the finance department manipulating and playing with figures related to the off-balance sheet, not following the policy of disclosure and not fulfilling the requirements of transparency. Companies' owners (having limited shares responsibility) and managers therefore may have too much of an incentive to take risks, as the creditors would be the party which would suffer most in case of a bankruptcy. This could result in an inefficient use of resources (Braendle, 2017).

Fama and Jensen (1983a) explained the agency issues in the firm that the ownership lies with the shareholders and control leads to managers who seek their personal interest at the expense of those shareholders. Keeping the above in view shareholders are trying to mitigate the conflict in between the shareholders and management. In general, they decide to pay some additional perks and bonuses to the agents which is known as agency cost. The main objective of the agency cost is to increase the level of productivity, efficiency and maximize the profit of the shareholders. In real term this agency cost is some sort of compensation to the managers other than their routine emoluments (Jensen & Meckling, 1976).

If shareholders will not decide to compensate the management then there is a number of chances of adverse selection and moral hazards (Braendle, 2017). Generally, in most of the current literature the management expenses are considered as input when measuring the efficiency. No one can deny the mangers have more access to the information than the shareholders and they have the edge in this aspect. In reality, managers are hired by the principal, but they have more information than the principal, so they have the more capacity to exploit the shareholders. This adverse selection and

moral hazards increase the conflict among the parties. The only solution is to compensate the agents with more remunerations and perks (Cummins & Weiss, 2013).

The phenomenon of economies of scale in the conventional insurance as well in the Islamic insurance industry can be seen in that scenario when per unit cost of the output (certain amount of premium or contributed collected) is minimizing with respect to time. It is worthwhile to note that inefficiencies may be possible when an abnormal level of output will increase. This may be due to the additional cost of the different factors of production which h are not used at the optimal level and simultaneously the bureaucratic cost of the management, i.e. additional perks of the management and lack of transparency from the accounting department. It is also noted that whenever the scale of output increases simultaneously the hierarchy of the organization also increases which ultimately has positive impact on the operational cost. The size of the firm is positively associated with the agency cost and the phenomenon of red tape (Coelli, Rao, O'Donnell, & Battese, 2005).

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter explains the research design and methodology of the present study. The chapter explains the whole process carried out by the researcher to meet the objectives of the study. These includes research framework, measurement and variable definition, development of hypotheses and the measurement of variables, data sources and data collection process. At the end of the chapter, methods used to analyze the data are described.

3.2 Research Design

This study follows the quantitative techniques as a research design. The research design directs attention to the research framework for the researcher to determine certain method for managing and conducting research. In addition, research design provides proper guideline to the researcher in selecting data collection and analysis of data. The research design for the current study developed from the existing literature review including Grmanová and Strunz (2017), Kutlar, Kabasakal, and Ekici (2017), Alipour, Mahfoozi, and Shafieyan (2018) and Ngan (2014) in financial sector. Furthermore, literature review in the study has managed useful information in relation with methodologies, variables measurement and techniques for data analysis applied in the current study.

The research design consists of two stages. In first stage, Technical efficiency, pure technical efficiency and the scale efficiency of the *takaful* and insurance firms is

calculated. These efficiencies are calculated by the frontier techniques. From the literature review of the insurance and *takaful* industry, efficiency is an input-output equation. There are three main inputs including equity, general & management expenses and claim expenses. These selected inputs are in accordance with the previous studies including Biener et al. (2016), Alhassan and Biekpe (2015), Al-Amri (2015), Zimková (2015), Ismail et al. (2011) etc. Premium or contribution collected and net investment income are chosen as outputs (Vaughan & Vaughan, 2008). These selected outputs are in accordance with the studies of Biener et al. (2016), Jaiyeoba and Haron (2015), Faruk and Rahaman (2015), Rahman (2015), Abduh et al. (2012), Al-Amri (2015) etc. These values are taken from the annual reports of the *takaful* and insurance firm, the Insurance Association of Pakistan (IAP) annual reports and the Securities Exchange Corporation of Pakistan (SECP) reports.

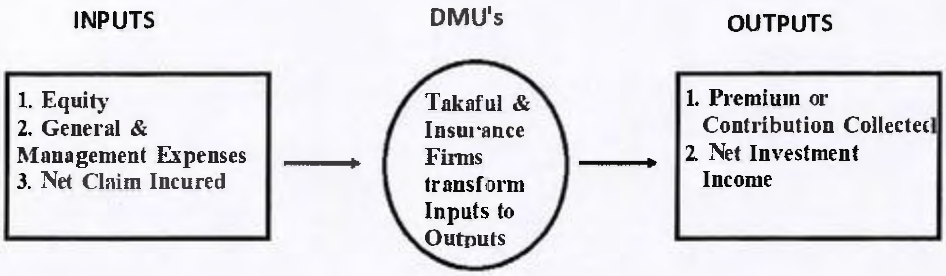
The investigation would be following applied the Malmquist Productivity Index (MPI) approach based on extension of DEA approach in order to calculate any changes in total factor productivity (TFP), technology & technical change and Pure Efficiency & scale efficiency change of conventional insurers and *takaful* operators over the selected sample period of 2008 to 2016.

After computation of efficiency and productivity scores of the insurance and *takaful* industry in first stage, this study will attempt to identify the explanatory variables of these dependent variables in the second stage. The efficiency scores (Technical Efficiency, Pure Technical Efficiency and Scale Efficiency) from the first stage analysis is used as the dependent variable in the second stage analysis. There are four (4) independent variables being used in this as the determinants of efficiency to test their relationships with efficiency. These variables are Size (log of total assets), Market

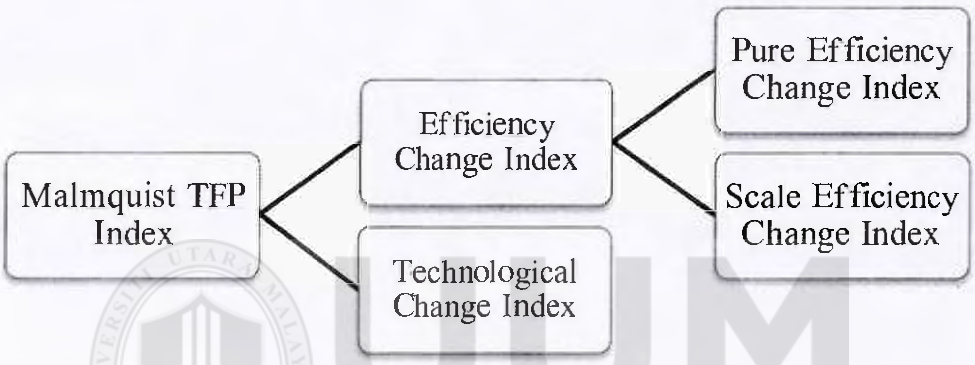
Share (ratio of premium of each firm to total premiums), Profitability (Return on Equity) and Leverage (equity to Asset) Ratio of Islamic and conventional firms.

3.3 Research Framework

Research framework is displayed in Figure 3.1, which is developed on recent literature review related to the *takaful* and insurance industry. The research framework is based on Firm Theory and Agency Theory. As defined in research design, firstly, Data Envelopment Analysis (DEA) technique is used to measure the technical, pure technical and scale efficiency. Malmquist Productivity Index (MPI) technique is used to measure the total factor productivity (TFP) change. And in second stage, Tobit Regression model is used to measure the relationship of Asset, Market Share, Profitability and Leverage with technical, pure technical and scale efficiency of *takaful* and insurance industry.



The three inputs and two outputs used in DEA model to calculate technical, pure technical and scale efficiency



Flow diagram of productivity measurement by Malmquist Productivity Index (MPI)

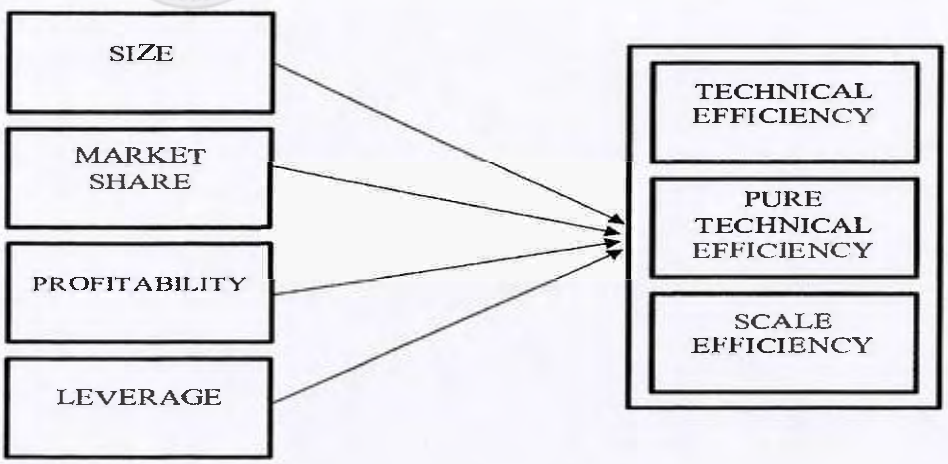


Figure 3.1
research framework

3.4 Measurements and Variable Definition

As shown in Figure 3.1, the study consists of multiple stages. In first stage, efficiencies of the *takaful* and insurance firms are calculated and compared. Research framework represents that there are three inputs being used to produce two outputs. Decision making Units (DMU's) being established for each firm and it is being calculated that which firm efficiently produce the maximum outputs by consuming minimum inputs. Frontier Analysis technique is being used for estimating the efficiencies of the firms. Three kind of efficiencies are being calculated i.e. Technical efficiency, Pure Technical Efficiency and Scale Efficiency.

3.4.1 Measurement of Efficiency

There are various methods of measuring efficiency of financial institutes. Some of these methods include the parametric approach that were discussed earlier. The flow trend of the measurement of efficiency is defined in **Figure 3.2**. The figure presents the flow chart and design step by step.

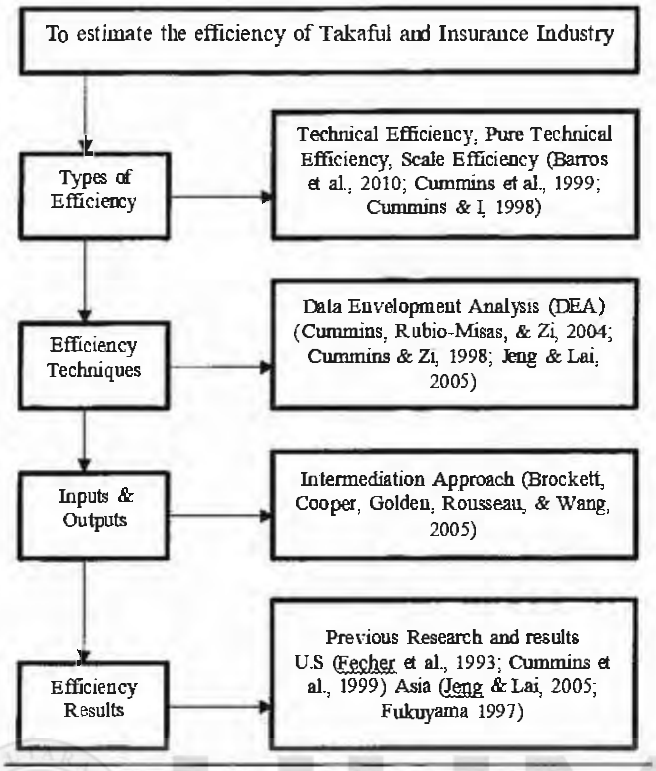


Figure 3.2
procedure of estimating the insurance & takaful efficiency

In this study, the efficiency of *takaful* and insurance industry of Pakistan will be measured. At first step three types of efficiency will be measured, i.e. technical efficiency, pure technical efficiency and Scale Efficiency. The present study adopts the Data Envelopment Analysis (DEA) approach, by using the DEAP software 1.2.2.

A non-parametric DEA is employed with variable returns to scale (VRS) assumption to measure input-oriented for technical efficiency, pure technical efficiency and scale efficiency of insurance and *takaful* industry of Pakistan. This methodology has been used by many previous studies including (Al-Amri, 2015; Cummins, Rubio-Misas, & Vencappa, 2017; Ismail et al., 2011; Md Saad, 2012; Zimková, 2015). DEA entails the construction of a non-parametric production frontier on the basis of the actual input-output observation in the sample as related to each firm's efficiency measured in the sample (Coelli, 1996). The discussion of DEA begins with a description of the input-

orientated constant returns to scale (CRS) model. The model was developed by Charnes et al. (1978). The extent to which the observed combinations of input and output are enveloped by production frontier is determined by convexity constraint, but there is no such imposition in the case of CRS.

Therefore, the method of variable returns to scale (VRS) creates a convex hull that securely covers the data compared to constant return to scale (CRS) and offers a more efficient score more than or equal to the scores acquired through its counterpart model. In the case of CRS and VRS, scale efficiency can be found from their respective ratio of technical efficiency to pure technical efficiency. The scale efficiency (SE) is defined by

$$SE = \frac{TE_{CRS}}{TE_{VRS}} \qquad \text{.....Equation 3-1}$$

However, the scale efficiency measure does not show whether the concerned DMU is operating under the condition of increasing returns to scale (IRS) or decreasing returns to scale (DRS). In order to point out the form of returns to scale, comparison is made between the scores associated with CRS and VRS. For example, a firm is operating under the assumption of constant returns to scale (CRS) if the score for VRS equals that of CRS. In a case where the scores for VRS and CRS are not equal, then it can be established whether the operation of the firm is under the assumption of increasing return to scale (IRS) or decreasing return to scale (DRS). In order to pursue this, the DEA model is employed under the assumptions of non-increasing returns to scale (NIRS). Thus, a firm is operating under the DRS assumption in a case where the score of VRS equals that of NIRS. On the other hand, a firm is operating under the assumption of IRS in a case where the score for VRS differs from that of NIRS.

3.4.1.1 Identifying Inputs and Outputs

In many of the studies conducted in the insurance and *takaful* industry, efficiency is an input-output equation. The primary input is the group of people who create or manage the other inputs and relatively easy to devise in measuring effort in terms productions cost. Insurance and *takaful* operations consist of underwriting and accessing a new insurable risk, premium and contribution collection production, claim management and settlement, reinsurance/*re-takaful* and investments into profitable return assets. At the same time, the management team also engage in daily operations, such as accounting, auditing, marketing of agencies and brokerage services, legal, loss surveyor etc. Managements expenses use as inputs as these involve of the company staff running everyday operations they should act as efficient as possible (Rejda, 2011).

The underwriter of insurance and *takaful* constantly strives to select certain types of insurable risk application by proposal given by policyholders. However, they should reject others higher probability changes of losses so to obtain a profitable portfolio of business, especially the higher claim ratio in the general insurance industry(Rejda, 2011). As a result, there are three major inputs equity, general & management expenses and claim expenses. This selected input are in accordance with the previous studies including Biener et al. (2016), Alhassan and Biekpe (2015), Al-Amri (2015), Zimková (2015), Ismail et al. (2011) etc.

For outputs in an insurance industry, outcomes of profitability and productivity are measured by volume produced or sold and money earned after all costs are paid. Output which measure the activities undertaken by the relevant inputs are capacity utilization and the ability to accomplishing outcomes over the period of time. In his study,

premium or contribution collected and net investment income are chosen as outputs (Vaughan & Vaughan, 2008). The insurance company and *takaful* operator collects premiums or contribution from policyholders, later to invests the fund collected normally in low risk investments assets. These selected outputs (Premium or Contribution Collected & Net Investment Income) are in accordance with the studies of Biener et al. (2016), Jaiyeoba and Haron (2015), Faruk and Rahaman (2015), Rahman (2015), Abduh et al. (2012), Al-Amri (2015) etc.

3.4.2 Measurement of Productivity

The investigation would be following applied the Malmquist Productivity Index (MPI) approach based on extension of DEA approach in order to calculate any changes in total factor productivity (TFP), technology & technical change and Pure Efficiency & scale efficiency change of conventional insurers and *takaful* operators over the selected sample period of 2008 to 2016.

The MPI estimates the change in efficiency of a DMU between the two time periods and is explained as the product of the terms "Catch-up (C)" and "Frontier-shift (F)".

MPI = (Catch-up) × (Frontier-shift) ----------**Equation 3-2**

The first term catch-up also called recovery, reflects the efforts attained by a DMU for the improvement of its efficiency, whereas the frontier-shift also known as innovation term explain the change in efficient frontiers in the DMU between the two specified time periods suppose time 1 and time 2. The DMU_0 at time period I is explained as (x_0^1, y_0^1) while at period 2 can be explained as (x_0^2, y_0^2). The catch-up effect can the defined as follow;

$$C = \frac{\delta^2\ ((x_0,y_0)^2)}{\delta_1\ ((x_0,y_0)1)}$$ ---------- **Equation 3-3**

If the value of C is greater than 1, it indicates the efficiency is improved in period 2 as compare to period 1, if the value is equal to one it reflects the status quo, whereas value less than 1 indicates the regress in efficiency.

The frontier-shift effect contributes to final value of the change in efficiency of the DMU, as the catch-up effect is evaluated by the distances from the respective frontiers of the measured efficiencies. The frontier-shift effect at $(x_0^1\ , y_0^1)$ can be explained as follows;

$$F = \left[\frac{\delta^1\ ((x_0,y_0)^1)}{\delta^2\ ((x_0,y_0)^1)} X \frac{\delta^1\ ((x_0,y_0)^2)}{\delta^2\ ((x_0,y_0)^2)}\right]^{1/2}$$ ----------**Equation 3-4**

It is already mentioned that the Malmquist Productivity Index (MPI) is the product of catchup and frontier and it can be explained as follow;

$$MPI = \left[\frac{\delta^1\ ((x_0,y_0)^2)}{\delta^1\ ((x_0,y_0)^1)} X \frac{\delta^2\ ((x_0,y_0)^2)}{\delta^2\ ((x_0,y_0)^1)}\right]^{1/2}$$ ----------**Equation 3-5**

The above equation consists of 4 terms; $\delta^1\ ((x_0,y_0)_1)$, $\delta^2\ ((x_0,y_0)_2)$, $\delta^1\ ((x_0,y_0)_2)$, $\delta^2\ ((x_0,\ y_0)_1)$. The first two terms explain the measurements for the same time period, whereas the last two terms express the comparison with the second time period. MPI >1 means increase in the total factor productivity for time period 1 to 2, MPI = 1 means no change in factor productivity index, whereas MPI < 1 explains the deterioration in the factor productivity of the firm. This study used the DEA Solver-Pro (Version 13) to calculate the Malmquist productivity index (MPI) values.

3.4.3 Two-Stage Approach

After computation of efficiency and productivity scores of the insurance and *takaful* firms by employing the DEA technique in first stage, an effort will be made in this study to identify the explanatory variables of these efficiencies as dependent variables in the next stage. The two-stage approach is the most prominent approach in the efficiency studies suggested by (Coelli et al. 2005). Under this approach, the efficiency score from the DEA (first stage analysis) model is used as the dependent variable for analysis in the second stage.

Three different models of efficiency (TE, PTE and SE) will be examined to evaluate the determinants of these efficiencies. The outcome of efficiency score are between 0 and 1. It is appropriate, if the dependent variable has bounded output, to employ a limited dependent variable technique, like Tobit Regression model for multivariate analysis. Therefore, these models can be defined as under

$$TE = \beta 1SIZE + \beta 2MS + \beta 3ROE + \beta 5LEV + \varepsilon i \quad \text{--Equation 3-6}$$

$$PTE = \beta 1SIZE + \beta 2MS + \beta 3ROE + \beta 5LEV + \varepsilon i \quad \text{--Equation 3-7}$$

$$SE = \beta 1SIZE + \beta 2MS + \beta 3ROE + \beta 5LEV + \varepsilon i \quad \text{--Equation 3-8}$$

Where;

TE = technical efficiency score

PTE = pure technical efficiency score

SE = scale efficiency score

SIZE= size

MS = Market Share

ROE= return on equity

LEV= Leverage ratio (Equity to Asset)

It is worth to mention that simple linear regression model is found to be inappropriate in the current study because the range of efficiency scores found from DEA model is censored. In statistics, the censored data can be explained as, the data which lies between any specific limits means the data lies between any lower and upper limit. The outcome of the efficiency values from the DEA model always fall between 0 and 1, and are considered as censored values (Chen, Xu, & Chen, 2017). For this reason, applying ordinary least squares technique could lead to biased estimates if the observation's significant position equal to one (Rosman, Wahab, & Zainol, 2014). In that condition, the regression model that is considered appropriate is Tobit or censored regression model that addresses the skewed and truncated data (Fadzim, Aziz, & Jalil, 2017; Nisar, Peng, Wang, & Ashraf, 2018).

3.5 Data collection Sources

In order to investigate the relationships among variables in the research framework, secondary data composed of figures and financial ratios which are extracted from annual reports of 14 insurance and 4 *Takaful* companies of Pakistan over the period of 2008 to 2016, State Bank of Pakistan (SBP (Quarterly Compendium), 2011, 2013, 2015; SBP, 2016), Securities Exchange Corporation of Pakistan and reports from Insurance Association of Pakistan. The dataset further was converted to a panel, which

is composed of cross sections data and is used in this study. Hsiao (2014) highlighted that panel data gives larger number of data points, increased degree of freedom and reduces the multicollinearity problem between explanatory variables. Hence, this increases the effectiveness of an econometric model.

In this study accounting measure are used instead of measures based on the market data because most of the *Takaful* companies are incorporated in year 2006 and 2007. Moreover, Rivard and Thomas (1997) indicated that the use of accounting measure is common in the studies of financial institutes. They also noted that the data which is reported by the financial institutes/firms or regulatory authorities is less problematic as compared to other industries because of the uniform implementation of prudential rules regarding reporting of data by the regulatory authorities. Agusman, Monroe, Gasbarro, and Zumwalt (2008) highlighted that market measure and accounting measure are important as they are mostly used by the regulatory bodies to assess the financial health.

The current study is based on the Insurance and *Takaful* sector of Pakistan. There are 46 insurance companies and 4 *takaful* companies in Pakistan ("State Bank of Pakistan, 2016,"). Some companies are excluded due to the unavailability of the data, some companies have not fallen into the group due to the unavailability of the full-length period and some firms have nominal values (approx. tends to zero) for the variables such as market share, asset size. The sample consists of fourteen insurance companies including State life insurance, Adamjee insurance, Alfalah insurance, Asia insurance, Askari insurance, Atlas insurance, Efu_General insurance, Efu_Life insurance, Habib insurance, IGI insurance, Jubilee Life insurance, New Jubilee insurance, Premier insurance, Shaheen insurance having more than 80% (in terms of premium) of market share of insurance sector and all four *takaful* operator, i.e. Takaful Pak, Pak-Qatar

(General), Pak-Qatar (Family) and Dawood Takaful. The firm (insurance or *takaful*) which is enlisted above is taken as a unit of analysis. The sources of data for variables are displayed in Table 3.1

Table 3.1
data sources

Variable	Data Source	Duration
Equity	Annual Reports of firm, Published reports of State Bank of Pakistan	2008-2016
General & Management Expenses	Annual Reports of firm, Published reports of State Bank of Pakistan	2008-2016
Net Claim Incurred	Annual Reports of firm, published reports of State Bank of Pakistan, Published reports of Insurance Association of Pakistan	2008-2016
Premium or Contribution Collected	Annual Reports of firm, published reports of State Bank of Pakistan, Published reports of Insurance Association of Pakistan	2008-2016
Net Investment Income	Annual Reports of firm, published reports of State Bank of Pakistan	2008-2016
Size (Log of total Assets)	Annual Reports of firm, published reports of State Bank of Pakistan	2008-2016
Market Share (ratio of Premium of each firm to total Premiums)	Annual Reports of firm, published reports of State Bank of Pakistan, Published reports of Insurance Association of Pakistan	2008-2016
Profitability (Return on Equity)	Annual Reports of firm, published reports of State Bank of Pakistan	2008-2016
Leverage (Equity to Asset) ratio	Annual Reports of firm, published reports of State Bank of Pakistan	2008-2016

The period is chosen for the reason that, although *takaful* operators allowed to start their business in 2005 but all the *takaful* operators started their business in 2007.

3.6 Hypotheses Development

After finding the efficiencies and the productivity change in the efficiencies of the insurance and *takaful* industry, the next step is to find the determinants of technical, pure technical and scale efficiency. In this study following hypotheses are developed based on the literature survey.

The hypotheses of this study are development mainly based on Agency Theory and Firm Theory framework. According to agency theory, problem exists in a firm when there is a conflict in desired goals of principal and agents. The principle or shareholders expected the manager to always defend the main interest of the principles whereas an agency cost would be a burden to the firms due to the conflict of interest between a principal and an agent (Cummins & Weiss, 2013). This situation between the principle and management create the agency problem which can affect market share (premium collection) and the asset size. Thus, the hypothesis of size and market share are developed in accordance to Firm Theory.

Firm Theory emphasize the improvement in the efficiency of a firm and productivity level determines by an economy concept represents the economies of scale. The theory suggests that in a long run the average costs per unit decreases in the same time the output volume increases. The firm can achieve the economies of scale by reducing the long run firm total costs by producing a larger volume of output. The total costs such as rental, capital goods and managerial expenses minimize while per unit output increase (Cummins, et al. 2013). Thus, the hypothesis of profitability and leverage (equity to asset) are developed in accordance with Firm Theory.

3.6.1 Asset Size

A number of studies have been conducted to find the impact of size upon efficiency but consensus has not been established (Avkiran, 1999; Havrylchyk, 2006). The previous literature persuades the relationship between size and efficiency of the insurance industry. It explained the available significant scale advantage to the large firms. This advantage resulted the reduction in the output per unit cost in the process of increasing output volume. Large firms have the advantage of the less fixed per unit cost for the greater output like financial capital and infrastructure cost.

Similarly, scale economies may arise from the learning effects gained by managers operating at larger scale. In addition, in the insurance sector it is usually assumed that a larger scale of operation reduces income volatility, since the pooling of risks works better the larger the risk pool (see Cummins & Rubio-Misas, 2006). Biener et al. (2016), Alhassan et al. (2015) and Luhnen (2009) also found that large firms are more efficient and profitable as compared to small and medium firms.

On the other hand, the inability of larger firms to monitor and control activities of large-scale operations results in diseconomies of scale. Some studies also described that larger firms have failed to produce cheaper output, so size has negative relation with the efficiency of a firm (Fenn et al., 2008). MA (2015) also found that smaller firms are more efficient to utilize their inputs to produce outputs. Therefore, the hypothesis is developed as follows:

H1 a: There is a significant relationship between size and technical efficiency of insurance firms.

H1b: There is a significant relationship between size and pure technical efficiency of insurance firms.

H1e: There is a significant relationship between size and scale efficiency of insurance firms.

H2a: There is a significant relationship between size and technical efficiency of *Takaful* firms.

H2b: There is a significant relationship between size and pure technical efficiency of *Takaful* firms.

H2c: There is a significant relationship between size and scale efficiency of *Takaful* firms.

3.6.2 Market Share

Different studies examined the impact of the market share on the efficiency of the firm and found the paradoxical results. Studies by (Burca & Batrinca, 2014), (Fenn et al., 2008) and Ansah-Adu et al. (2011) described that variable of market share (MS) has positive significant impact on the efficiency of this sector. Whereas Yuengert (1993) and Cummins and Zi (1998) found that firms with significant market share are characterized by decreasing returns to scale.

H3a: There is a significant relationship between market share and technical efficiency of insurance firms.

H3b: There is a significant relationship between market share and pure technical efficiency of insurance firms.

H3c: There is a significant relationship between market share and scale efficiency of insurance firms.

H4a: There is a significant relationship between market share and technical efficiency of *Takaful* firms.

H4b: There is a significant relationship between market share and pure technical efficiency of *Takaful* firms.

H4c: There is a significant relationship between market share and scale efficiency of *Takaful* firms.

3.6.3 Profitability

Several studies have examined the impact of profitability on the efficiency of the firm. The profitability (ROE) appears to be positive impact on the efficiency of firms. Ismail et. al (2011) and Afza and Asghar (2012) support this assumption. On the other hand, Ataullah and Le (2006) and Casu and Girardone (2004) found that there is negative association in between profitability and efficiency. Therefore, the hypothesis is developed as follows:

H5a: There is a significant relationship between Profitability and technical efficiency of insurance firms.

H5b: There is a significant relationship between Profitability and pure technical efficiency of insurance firms.

H5c: There is a significant relationship between Profitability and scale efficiency of insurance firms.

H6a: There is a significant relationship between Profitability and technical efficiency of *Takaful* firms.

H6b: There is a significant relationship between Profitability and pure technical efficiency of *Takaful* firms.

H6c: There is a significant relationship between Profitability and scale efficiency of *Takaful* firms

3.6.4 Leverage

Some studies have estimated the Impact of leverage on efficiency including Dagogo and Okorie (2014), Pushner (1995), Foong and Idris (2012) and Alhassan and Biekpe (2015) examined for the financial system. Biener et al. (2016), Eling and Luhnen (2010b) and Luhnen (2009) also measured the impact of leverage on efficiency score and reported the different results. Therefore, the hypothesis is developed as follows:

H7a: There is a significant relationship between Leverage and technical efficiency of insurance firms.

H7b: There is a significant relationship between Leverage and pure technical efficiency of insurance firms.

H7c: There is a significant relationship between Leverage and scale efficiency of insurance firms.

H8a: There is a significant relationship between Leverage and technical efficiency of *Takaful* firms.

H8b: There is a significant relationship between Leverage and pure technical efficiency of *Takaful* firms.

H8c: There is a significant relationship between Leverage and scale efficiency of *Takaful* firms

3.7 Data Analysis Methods

The serial protocol of data analysis consists of two parts. The first part deals with descriptive and diagnostic tests performed to run regression analysis. While, the second part deals with regression model estimated for selection of appropriate model for panel analysis.

3.7.1 Descriptive Analysis

For the purpose of the descriptive analysis, various statistical techniques are employed to initially quantitatively summarize the data. The descriptive statistic analyzed in this study are the mean, median, standard deviation, maximum value and minimum value of dependent and independent variables which are displayed in chapter four section 4.2.

3.7.2 Diagnostic Test

The data for the present study is analyzed by using the Stata 1.4. However, the data has observed serial protocol before regression is performed. First, that data is summarized and initially analyzed through descriptive statistics. Second, before regression analysis

is conducted, several tests such as, multicollinearity, auto-correlation, and model specification tests are carried out. As this study uses panel data, a panel data tests are conducted in order to ensure an appropriate model to be used in the regression test. Once the appropriate panel data model has been identified, tobit regression analysis is performed.

3.7.2.1 Model Specification

Model specification test examine the independent variables in the model. This model is conducted to examine the available independent variables in the model (Stock & Watson, 2015). It represents an error, if any irrelevant variable added into the model or any relevant variable is omitted from the model. In the case of any omitted variable, the error term is inflated. If any of the extra variable is added to the model, the common variable with the extra variable may influence the common variance. Which can affect the estimation of regression coefficient in either case.

The linktest command is used to examine the model specification for the model with single equation (Hoffmann, 2016). This technique creates two new variables, one is the prediction variable called 'hat' which should be significant because of the predicted value. The second variable for squared prediction 'hatsq' which should not be significant. If the model is defined correctly, the squared value of the predicted variable should not have any explanatory value. Therefore, the variable 'hat' should be significant and the variable 'hatsq' should not be significant for the correctly specified model.

3.7.2.2 Multicollinearity

The primary objective of this test is to measure the correlation among several independent variables. The main worry is that when there is rise in the level of multicollinearity, the estimated coefficients of the regression model tends to be unstable and the coefficients of the standard errors tend to become enough large. The high level of multicollinearity made the estimation of the regression coefficient unstable and un reliable and a small change in model or sample might be reflected as extreme (Yu, Jiang, & Land, 2015).

Multicollinearity is checked by examining collinearity tolerance and the variance inflation factor (VIF) for all the variables in the regression model. Haslwanter (2016) suggests that if an independent variable has a collinearity tolerance more than 0.1 and VIF less than 10, a multicollinearity problem does not exist.

3.7.2.3 Pearson correlation test

The Pearson correlation test is conducted to explore the correlations between the independent variables and to indicate the existence of multicollinearity. The Pearson correlation coefficient, r, can take a range of values from +1 to -1. A value of 0 indicates that there is no association between the two variables. A value greater than 0 indicates a positive association; that is, as the value of one variable increases, so does the value of the other variable. According to (Gujarati, 2014) and (Hair, Black, Babin, Anderson, & Tatham, 2006), the correlation between the independent variables is not a concern until it exceeds 0.8.

3.7.2.4 Normality Test

The Wald Chi-Square test statistic is the squared ratio of the Estimate to the Standard Error of the respective predictor. The Wald Chi-Squared Test is a way to find out if explanatory variables in a model are significant (Agresti, 2018). The test calculates the degree of normal distribution of the sample data. This test in the context of regression is used to determine whether a certain predictor variable X is significant or not. "Significant" means that they add something to the model; variables that add nothing can be deleted without affecting the model in any meaningful way.

3.7.3 Tobit Regression

The hypotheses are tested by using Tobit (or censored) regression analysis in the current study. The Tobit Model was proposed by James Tobin in 1958. It estimates a linear regression model for a left-censored dependent variable. To avoid misleading results, before the model is accepted the regression diagnostic tests must be applied to verify the data's compatibility for the Tobit regression analysis. The data for the present study is analyzed by using the STATA Software 1.4.

3.8 Summary

This chapter discussed the model, methodology which is selected for the empirical analysis of the current study (DEA and Tobit regression analysis) and the methods for the collection of the data. The input and output used in DEA are discussed together with the variables used in the Tobit regression. The DEA is used to decompose various types of efficiencies which are technical, pure technical and scale efficiencies, for the purpose of identifying the key source of the efficiency of insurance and *takaful* industry. Then

variables and hypotheses are discussed. Finally, selection and measurement of variables employed is highlighted based on literature review.

CHAPTER FOUR

EMPIRICAL RESULTS AND DISCUSSION

4.1 Introduction

In this chapter, the empirical results of Technical, Pure technical, Scale efficiencies for *takaful* and insurance companies of Pakistan from year 2008 to 2016 are discussed. The results of the descriptive statistics of input and output variables are presented in section 4.2. Section 4.3 presents the results of Data Envelopment Analysis (DEA). Section 4.4 presents the results of productivity change. Whereas, Section 4.5 discusses the empirical results of efficiency. Section 4.6 defines the assumptions of Tobit regression analysis. Section 4.7 elaborates the results of Tobit regression model. Section 4.8 summarize the results of hypothesis, section 4.9 discuss the hypothesis testing and discussion and section 4.9 presents the summary and some concluding remarks of the chapter.

4.2 Descriptive Statistics of Inputs and Outputs

Table 4.1 presents the descriptive statistics of the insurance and *takaful* firms. The Premium and Investment income are the outputs of the insurance/*takaful* industry. Average amount of premiums collected by the insurance companies is RS 8870 million for the under-study period whereas the average premium collected by the *takaful* companies is Rs 1177 million. The mean NI Income for the insurance and *takaful* companies remain Rs 3141 million and Rs 132 million respectively for the entire study period.

Equity, Net Claims and Expenses are the inputs used for the measurement of the efficiency of *Takaful*/Insurance firms of Pakistan from 2008 to 2016. Average amount of Investment Income for insurance firms is Rs 3141million as compare to the average of *takaful* firms which is Rs 132 million. Average amount of equity for the insurance companies is Rs 3778 million as compare to the Equity of the *takaful* operator is Rs 390 million from 2008 to 2016. The mean value for the input variable of insurance firms is 2489 whereas the amount of average expense for *takaful* operators is Rs 167 million for the entire study period.

The range of Premium varies from minimum value Rs 47 million to Rs 90074 million and the standard deviation for the premium is 15859 for insurance firms whereas minimum premium collected by the *takaful* firms is Rs 34 million, maximum value is Rs 1334 million and standard deviation for NI Income of *takaful* firms remain Rs 266 million.

Table 4.1
descriptive statistics of the insurance firms from 2008 to 2016

	Mean		Std. Dev.		Minimum		Maximum	
	Insurance	*Takaful*	Insurance	*Takaful*	Insurance	*Takaful*	Insurance	*Takaful*
OUTPUTS								
Premium	8870	1177	15859	1860	47	34	90074	7494
Income	3141	132	11057	266	-5300	2	63722	1334
INPUTS								
Equity	3778	390	4564	179	177	131	17001	782
Net claims	3272	177	6732	197	7	2	37939	896
Expenses	2489	167	5358	92	16	33	27629	394

Note: The variables used are in million Pakistani Rupees.

The inputs equity has minimum value of Rs 177 million and maximum value Rs 17001 million for insurance firms whereas minimum Rs 131 million and maximum Rs 782 million for *takaful* firms. The values for Net Claims are minimum Rs 7 million & maximum Rs 37939 million for insurance firm and minimum Rs 2 million & maximum Rs 896 million for *takaful* firms. The standard deviation is 6732 for insurance and 197 for *takaful* companies. Expenses are minimum Rs 16 million & maximum Rs 27629 million for insurance firms and varies from minimum Rs 33 million to maximum Rs 394 million and the standard deviation is 5358 for insurance and 92 for *takaful* firm respectfully from 2008 to 2016.

The comparative mean value of insurance and *takaful* companies reflects the huge difference between the values. This difference is because *Takaful* industry started its business in Pakistan after the approval of *Takaful* Act, 2005. Foreign companies are encouraged to start their business and, currently four full-fledged *takaful* companies including *Takaful* Pak, Pak-Qatar (General), Pak-Qatar (Family) and Dawood *Takaful* are operating their business in Pakistan ("Securities and Exchange Commission of Pakistan 2016,"). As mentioned, *takaful* companies are in their infancy period and gradually getting the response from the market, they have comparatively small values from the insurance companies.

The other factor is the scale of business between the companies. This factor is responsible for the difference between minimum and maximum values and the large standard deviation. Ahmed et al. (2011) reported that Pakistani life insurance companies comprise 52% and 69% share of entire insurance market in terms of net premiums and assets. companies like state life insurance company (a government

owned life insurance company) retain a grander share in the market, on the other hand some companies have very small scale of business as they are new in market.

4.3 Measurement of Efficiency

This section represents the efficiency score and discusses the comparison of results estimated for the efficiency of insurance and *takaful* firms of the insurance industry of Pakistan. Data envelopment analysis is used to measure the different efficiencies with the assumptions of constant return to scale and variable return to scale. DEA Solver software is used to estimate the efficiencies of the insurance and *takaful* industry for the specified period of time. Data Envelopment Analysis (DEA) is used under the assumption of CRS and VRS to segregate the technical efficiency (TE) into pure technical efficiency (PTE) and Scale efficiency (SE). The results are presented in Table 4.2 to Table 4.6.

Table 4.2
Technical efficiency scores of Pakistani insurance companies: 2008-2016

Company Name	2008	2009	2010	2011	2012	2013	2014	2015	2016
Adamjee Insurance Co. Ltd.	1.00	1.00	0.82	0.39	0.41	0.61	0.45	0.51	0.46
Alfalah Insurance Co. Ltd.	1.00	0.94	0.66	0.51	0.29	0.26	0.26	0.29	0.41
Asia Insurance Co. Ltd.	0.88	0.81	0.92	0.30	0.27	0.76	0.48	0.44	0.36
Askari insurance	0.99	1.00	1.00	0.50	0.36	0.26	0.25	0.30	0.37
Atlas insurance	1.00	0.89	0.76	0.71	0.81	0.78	0.81	0.86	0.73
EFU-General insurance	0.95	0.91	0.91	0.58	0.42	0.41	0.39	0.42	0.61
EFU-Life insurance	1.00	1.00	1.00	0.91	0.65	0.50	0.50	0.72	0.53
Habib insurance	0.95	1.00	0.91	0.59	0.65	0.62	0.70	0.53	0.46
IGI insurance	1.00	0.97	1.00	1.00	0.61	0.64	0.96	1.00	1.00
jubilee Life Insurance	1.00	1.00	0.92	0.93	0.81	0.67	0.73	0.63	0.91
New jubilee insurance	1.00	1.00	1.00	0.85	0.57	0.49	0.38	0.42	0.42
Premier insurance	1.00	1.00	0.74	0.81	0.28	0.30	0.31	0.31	0.24
Shaheen insurance	1.00	1.00	0.75	0.47	0.26	0.18	0.25	0.24	0.34
State life insurance	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mean	0.98	0.97	0.88	0.68	0.53	0.53	0.53	0.55	0.56
Minimum	0.88	0.81	0.66	0.3	0.26	0.18	0.25	0.24	0.24
Maximum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Table 4.2 presents the Technical Efficiency (TE) scores for insurance firms which are measured on constant returns to scale. The average TE scores have decreasing trend for the insurance firms. In 2008, the TE for the insurance firms is 0.98, this mean that insurance firms were 98% technical efficient. These figures are decreasing by the passage of time and insurance firms secure the 0.97, 0.88, 0.68 and 0.53 score for 2009, 2010, 2011 and 2012 respectively. In 2013 and 2014, insurance firms were at same efficiency and they secure 0.53 TE score in these years. This score started improving

and in 2015, the TE score was 0.55 and in 2016, it approaches to 0.56. It is worthwhile to note that the technical efficiency scores were greater than 85% till 2009, generally the scores were declining from 2010 to 2016 and approached to 56%. It shows that there is a great scope for the inefficient companies to increase their output if they will operate at the same efficient level of the most efficient company in the sample of the study. On average, the best practice company is State Life Insurance Company whereas premier insurance is least efficient.

Table 4.3
Technical efficiency scores of Pakistani takaful companies: 2008-2016

Company Name	2008	2009	2010	2011	2012	2013	2014	2015	2016
Dawood *Takaful*	0.57	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Pak-Qatar (Family)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Pak-Qatar (General)	0.28	0.39	0.30	0.28	0.23	0.24	0.19	0.15	0.25
Takaful Pak	0.60	1.00	0.48	0.32	0.21	0.18	0.23	0.21	0.18
Mean	0.61	0.85	0.69	0.65	0.61	0.60	0.61	0.59	0.61
Minimum	0.28	0.39	0.30	0.28	0.21	0.18	0.19	0.15	0.18
Maximum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Table 4.3 represents the TE scores for the *takaful* operators of Pakistan from 2008 to 2016. The TE score for the *takaful* operators were 0.61 for 2008, 0.85 for 2009, 0.69 for 2010, 0.65 for 2011, 0.61 for 2012, 0.60 for 2013, 0.61 for 2014, 0.59 for 2015 and 0.61 for 2018. The table reflects that average technical efficiency scores of *takaful* operators in Pakistan ranged from minimum 59% (2013) to maximum 85% (2009). It shows on average their instability prevails in the technical efficiency of these operators. It may be due to the infancy stage of these operators or may be due to the internal and external shocks or still these operators are not immune with the system and have not

too much resilience power, therefore could not able to absorb these shocks. Two companies, Dawood *Takaful* and Pak-Qatar (Family) were most efficient among the *takaful* operators. However, on average all the conventional and Islamic insurance operators are producing under the production frontier and could not be able to get the optimal level. Kumar and Gulati (2008) defines that TE helps to measure the inefficiency of a firm due to its pure technical efficiency and scale efficiency i.e. TE is the combination of PTE and SE.

However, on average all the conventional and Islamic insurance operators are producing under the production frontier and could not be able to get the optimal level. The conventional Insurance companies are suffered 2%, 3%, 12%, 32%, 47%, 47%, 47%, 45% and 44% level of technical inefficiency during the corresponding period of the study respectively (2008-2016). Whereas *takaful* operators are suffered technical inefficiency, i.e. 39%, 15%, 31%, 35%, 39%, 40%, 39%, 41% and 39% during the sample period respectively (2008-2016).

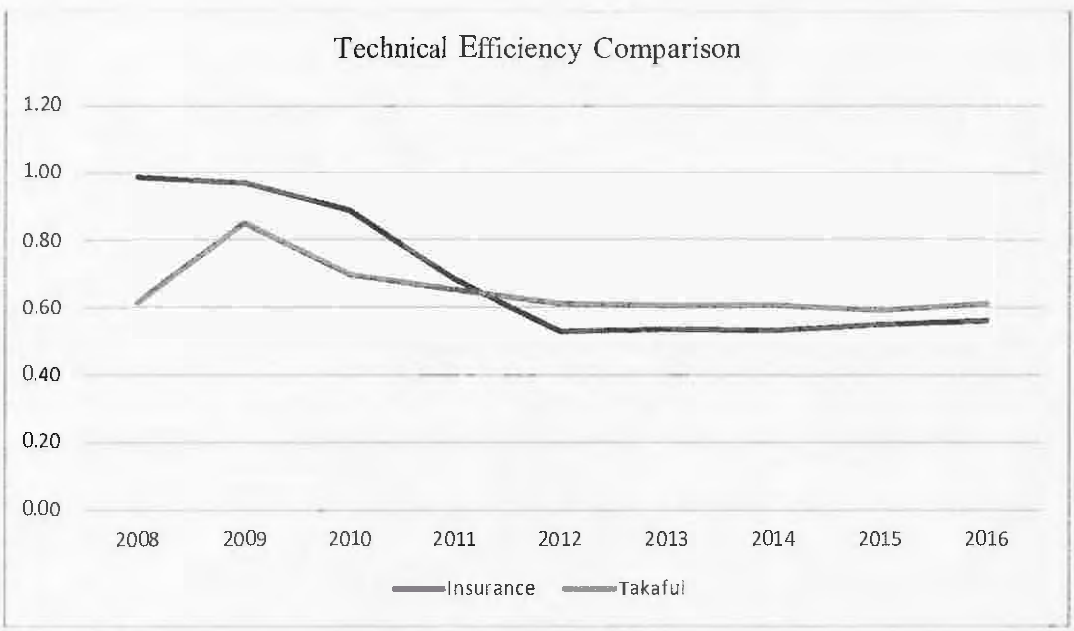


Figure 4.1
Technical efficiency comparison

The trend of the technical efficiency scores can be seen in Figure 4.1. It is clearly observed from the figure that there was a decline in the technical efficiency of the *takaful* operators from 2009 till 2011 because of their initial period but afterwards they competed well with the well-established insurance sector. In 2011, the average technical efficiency for the insurance and *takaful* firms was almost same and after 2011, *takaful* industry was more technical efficient as compared to insurance sector. On average, insurance companies were 69% and *takaful* operators were 65% technical efficient during the whole study period. One can conclude that both insurance and *takaful* companies observed decreasing trend in their technical efficiency. It may be because of that they have used their resources optimally and now these firms are closer to the constant return to scale. This result of the technical efficiency are consistent with the conclusions drawn by Janjua and Akmal (2015) for Pakistan and Abduh et al. (2012) for Malaysia. As mentioned earlier that Technical Efficiency is further decomposed into Pure Technical Efficiency and Scale Efficiency so the reason for the change in Technical efficiency will be defined after calculating the Pure Technical Efficiency and Scale Efficiency.

Table 4.4 presents the Pure Technical Efficiency (PTE) of Pakistan's insurance companies. It is observed that average pure technical efficiency is improved during the study period. During all the years (2008-2106) the average pure technical efficiency is higher than the average technical efficiency of the insurance firms. In 2008, the average pure technical efficiency for the insurance sector is one. It implies that all the conventional insurance companies were fully efficient for the pure technical efficiency during this year. The figures decreased gradually, the score for PTE was 99% in 2009 and 95%, 86% and 78% in 2010, 2011 and 2012 respectively. It remains 78% in 2013,

increase to 80% and 82% in 2014 and 2015 respectively and then decrease to 77% again in 2016. The mean value of the PTE is 86% for the entire study period.

Table 4.4
Pure Technical efficiency scores of Pakistani insurance companies: 2008-2016

Company Name	2008	2009	2010	2011	2012	2013	2014	2015	2016
Adamjee Insurance Co. Ltd.	1.00	1.00	1.00	0.79	0.75	0.87	0.95	0.99	1.00
Alfalah Insurance Co. Ltd.	1.00	0.95	0.79	0.66	0.46	0.43	0.37	0.44	0.51
Asia Insurance Co. Ltd.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.71
Askari insurance	1.00	1.00	1.00	0.62	0.50	0.40	0.33	0.40	0.44
Atlas insurance	1.00	0.90	0.77	0.72	0.85	0.79	0.82	0.89	0.74
EFU-General insurance	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
EFU-Life insurance	1.00	1.00	1.00	1.00	1.00	0.89	1.00	1.00	0.94
Habib insurance	0.95	1.00	0.96	0.64	0.72	0.72	0.77	0.76	0.62
IGI insurance	1.00	1.00	1.00	1.00	0.64	0.68	0.97	1.00	1.00
jubilee Life Insurance	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00
New jubilee insurance	1.00	1.00	1.00	1.00	0.98	0.79	0.65	0.58	0.48
Premier insurance	1.00	1.00	0.77	0.87	0.38	0.38	0.40	0.49	0.36
Shaheen insurance	1.00	1.00	1.00	0.75	0.61	0.91	0.87	1.00	1.00
State life insurance	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mean	1.00	0.99	0.95	0.86	0.78	0.78	0.80	0.82	0.77
Minimum	0.95	0.90	0.77	0.62	0.38	0.38	0.33	0.40	0.36
Maximum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Table 4.5 elaborates the Pure Technical Efficiency (PTE) scores for the *takaful* firms of Pakistan from 2008 to 2016. PTE of the *takaful* operators was almost consistent for the study period. The figures for the *takaful* operators were 0.89, 0.93, 0.92, 0.90, 0.88, 0.87, 0.85, 0.86 and 0.89 for 2008 to 2016 respectively. These values of the PTE remain between 85% to 93% for the entire study period and the total mean for the entire study period is 89%. (Alhassan & Biekpe, 2015) define the Pure Technical Efficiency (PTE)

that PTE addresses regarding the managerial inefficiencies or the inefficiency which is directly result of the managerial underperformance. In the corporate sector the management is trying to maximize the profit of the companies and also trying to equip themselves with the new techniques of management by getting the new knowledge of the market. Consequently, they are able to promote the image of the firms which has a positive impact on the pure technical efficiency. The pure technical efficiency was minimum in 2016 in both types of operators.

Table 4.5
Pure Technical efficiency scores of Pakistani Takaful companies: 2008-2016

Company Name	2008	2009	2010	2011	2012	2013	2014	2015	2016
Dawood *Takaful*	0.92	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Pak-Qatar (Family)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Pak-Qatar (General)	0.66	0.71	0.67	0.61	0.54	0.49	0.41	0.43	0.56
*Takaful*Pak	0.96	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mean	0.89	0.93	0.92	0.90	0.88	0.87	0.85	0.86	0.89
Minimum	0.66	0.71	0.67	0.61	0.54	0.49	0.41	0.43	0.56
Maximum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

The overall trend of the pure technical efficiency is graphically evident in Figure 4.2. Same as in the case of technical efficiency, the pure technical efficiency of the insurance sector was higher from 2008 to 2010 but after that in 2011 *takaful* operator performed well. Initially the investor's trust was low and simultaneously the management has a low level of understanding. However, eventually with the passage of time the learning by doing was hold in the *takaful* industry so it became more efficient than the conventional operators

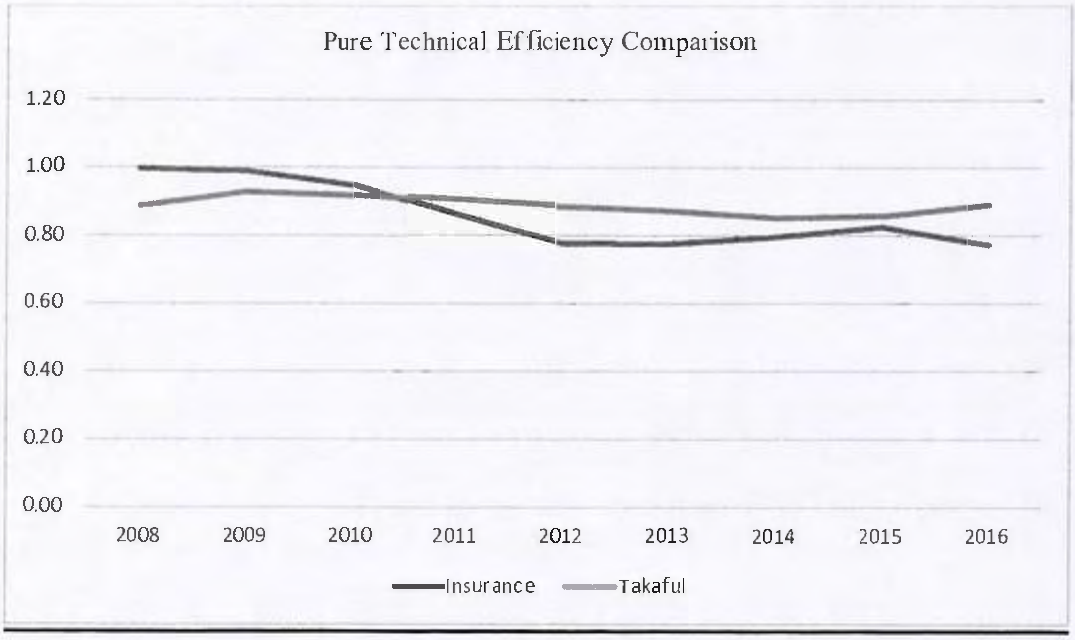


Figure 4.2
Pure Technical Efficiency comparison

Insurance firms secured 86% pure technical efficiency scores whereas *takaful* operators secured 89% efficiency scores. On average *takaful* firms are 3% more efficient than the conventional insurance firms during the under-study period. These results are consistent with the findings of previous studies, such as Awan and Iqbal (2015); Lee, Cheng, Nassir, and Ab Razak (2018); Saad et al. (2006). It is worthwhile to note that pure technical efficiency is relatively higher in the *takaful* operators. As it is mentioned above that these firms are newly established. Therefore, they are still not able to fully utilize their resources and newly trained managers were also trying to play their role in increasing the productivity of the firms.

Table 4.6 depicts the scale inefficiency of the insurance industry for the study period. The insurance firms have also decreasing trend in scale efficiencies. These firms attain the 99% scale efficiency in 2008. These firms were 98% scale efficient in 2009 whereas scale efficiency index remain 93%, 79% and 69% scale efficient in 2010, 2011 and

2012 respectively. In rest of the years, scale efficiency for the insurance firms was 70%, 68%, 67% and 73% for 2013 to 2016 respectively.

Table4.6
Scale efficiency scores of Pakistani Insurance companies: 2008-2016

Company Name	2008	2009	2010	2011	2012	2013	2014	2015	2016
Adamjee Insurance Co. Ltd.	1.00	1.00	0.82	0.49	0.54	0.70	0.47	0.51	0.46
Alfalah Insurance Co. Ltd.	1.00	0.99	0.83	0.77	0.63	0.59	0.69	0.67	0.79
Asia Insurance Co. Ltd.	0.88	0.81	0.92	0.30	0.27	0.76	0.48	0.44	0.51
Askari insurance	0.99	1.00	1.00	0.81	0.72	0.64	0.74	0.75	0.83
Atlas insurance	1.00	0.99	0.99	0.98	0.95	0.99	0.99	0.97	0.98
EFU-General insurance	0.95	0.91	0.91	0.58	0.42	0.41	0.39	0.42	0.61
EFU-Life insurance	1.00	1.00	1.00	0.91	0.65	0.56	0.50	0.72	0.56
Habib insurance	1.00	1.00	0.95	0.92	0.90	0.86	0.90	0.70	0.74
IGI insurance	1.00	0.97	1.00	1.00	0.96	0.95	0.99	1.00	1.00
jubilee Life Insurance	1.00	1.00	0.95	0.93	0.81	0.67	0.73	0.63	0.91
New jubilee insurance	1.00	1.00	1.00	0.85	0.58	0.62	0.58	0.73	0.88
Premier insurance	1.00	1.00	0.96	0.94	0.74	0.79	0.76	0.64	0.66
Shaheen insurance	1.00	1.00	0.75	0.63	0.42	0.20	0.29	0.24	0.34
State life insurance	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mean	0.99	0.98	0.93	0.79	0.69	0.70	0.68	0.67	0.73
Minimum	0.88	0.81	0.75	0.30	0.27	0.20	0.29	0.24	0.34
Maximum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Table 4.7 describes the scale efficiency score for the *takaful* firms of Pakistan from 2008 to 2016. Scale efficiency score of the *takaful* firms for 2008 was 67%. In 2009, *takaful* operators were 89% efficient whereas scale efficiency score for *takaful* operators was 73%, 69%, 66%, 67%, 67%, 64% and 66% from 2010 to 2016 respectively.

Table 4.7
Scale efficiency scores of Pakistani Takaful companies: 2008-2016

Company Name	2008	2009	2010	2011	2012	2013	2014	2015	2016
Dawood *Takaful*	0.62	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Pak-Qatar (Family)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Pak-Qatar (General)	0.42	0.55	0.45	0.46	0.42	0.49	0.46	0.34	0.45
Takaful Pak	0.62	1.00	0.48	0.32	0.21	0.18	0.23	0.21	0.18
Mean	0.67	0.89	0.73	0.69	0.66	0.67	0.67	0.64	0.66
Minimum	0.42	0.55	0.45	0.32	0.21	0.18	0.23	0.21	0.18
Maximum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Table 4.6 and Table 4.7 reflect the scale efficiency scores for the insurance and *takaful* firms respectively. Average scale efficiency for all the operators (conventional and Islamic) is also not stable during this study period. Alhassan and Biekpe (2015) elaborate the scale inefficiency which is caused by the operation of the firm rather by their management. Scale efficiency is directly linked to the size and technology. *Takaful* operators were new in the market and they were expanding their network and product range. For this expansion, *takaful* operator were bearing extra cost for attaining the per unit output which was suffering their efficiency and these firms were scale inefficient for the study period.

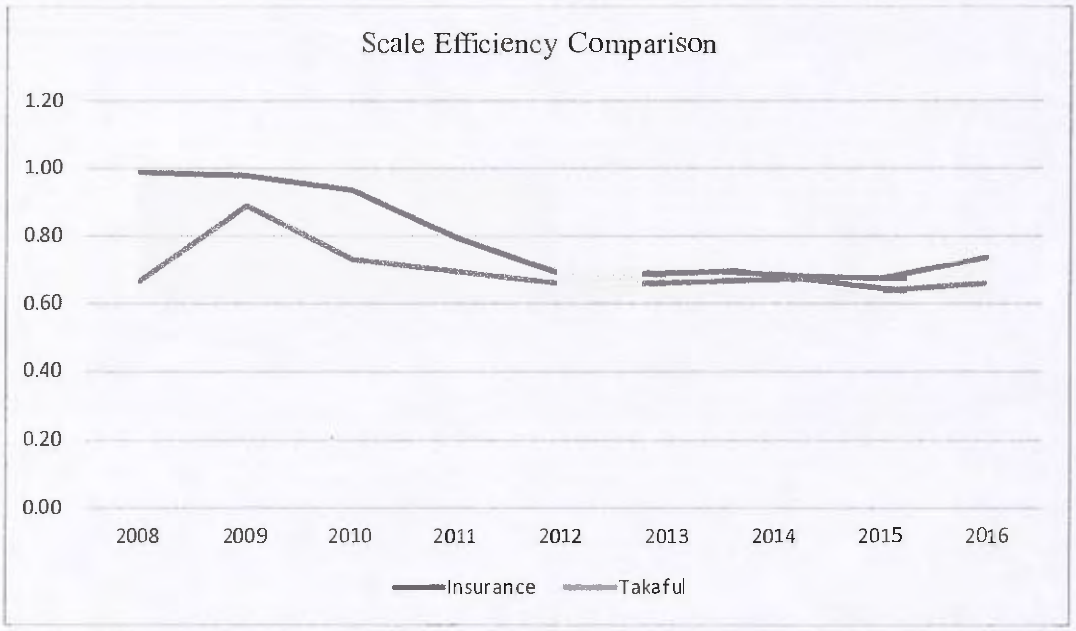


Figure 4.3
Scale efficiency comparison

Figure 4.3 shows the graphical illustration of the scale efficiencies of the *takaful* and insurance companies from 2008 to 2016. It is clearly evident that the *takaful* operators were scale inefficient as compared to insurance firms. *Takaful* operators were in their infancy stage which is also a major constraint in obtaining the scale efficiency. The issues like lack of liquidity and lack of optimal level of capital could not be able to fulfill the requirement of new technology. Moreover, IT and less growth in providing the online services, etc. are the major reason for the scale inefficiency. There is an issue of non-optimal utilization of resources and also firms are in the stage of their progress. Rahman et al. (2017) elaborate the inflationary pressure of the economy. Scale inefficiencies may be due to the cost push inflation which was observed in Pakistan during this period. Alhassan and Biekpe (2015) described that the adoption of new technologies in insurance operations would be most beneficial in terms of scale efficiency improvement for the industry. Biener et al. (2016) define that the high scale efficiency levels of insurers are partially a result of their large size. These results are

consistent with the findings of previous studies, such as Bertoni and Croce (2011); Owusu-Ansah, Dontwi, Seidu, Abudulai, and Sebil (2010) and Alhassan and Biekpe (2015)

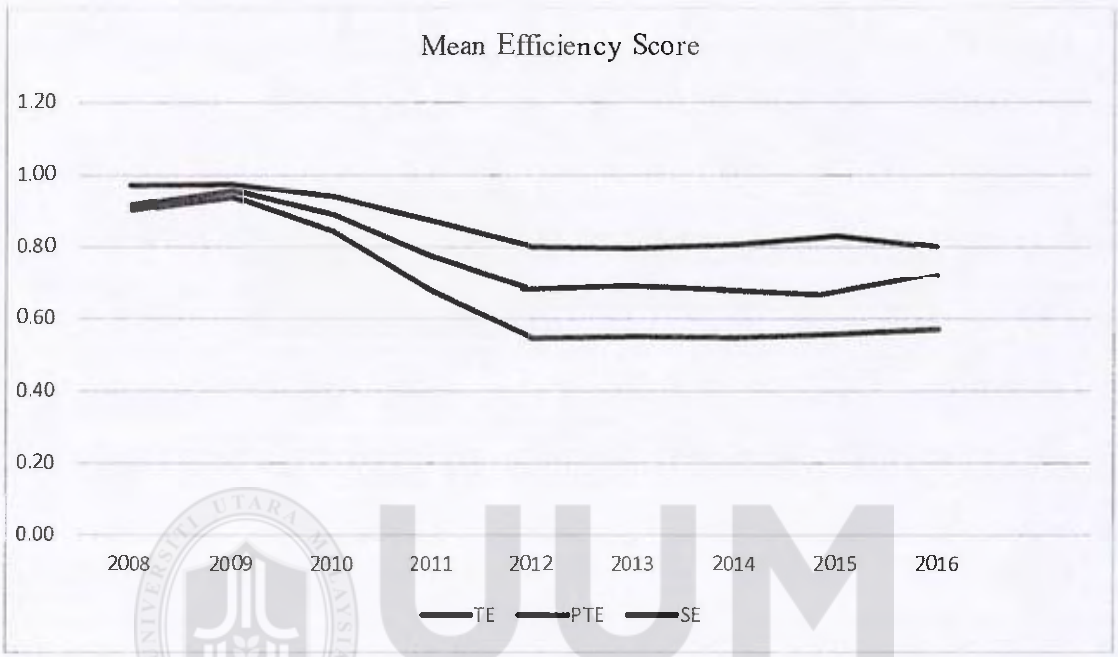


Figure 4.4
trend of the average Technical, Pure Technical and Scale efficiency

Figure 4.4 presents the graphical comparison of technical, pure technical and scale efficiencies of the overall insurance sector including the insurance and *takaful* firms. Pure technical efficiencies of the insurance sector are high as compared to the scale efficiency. Scale efficiency is the main reason for the deficit in technical efficiency of the entire insurance sector. The results reflect that the firms under study are efficient with respect to the managerial services and utilized efficiently its human resource as compared to the use of capital, technology and available financial resources. This may be due to the inflationary pressure, non-optimal utilization of the resources, devaluation Pakistan's currency and investors' weak expectations about the market, etc.

Table 4.8
descriptive statistics of DEA estimates of efficiencies for Insurance and Takaful operators, 2008-2016

	Descriptive Statistics	*Technical Efficiency*	*Pure Technical Efficiency*	*Scale Efficiency*
Insurance	Mean	0.69	0.86	0.80
Firms	Standard Deviation	0.27	0.20	0.22
	Minimum	0.18	0.33	0.20
	Maximum	1.00	1.00	1.00
Takaful	Mean	0.65	0.89	0.70
Firms	Standard Deviation	0.37	0.20	0.32
	Minimum	0.15	0.41	0.18
	Maximum	1.00	1.00	1.00

Table 4.8 illustrates the descriptive statistics of the technical efficiency, pure technical efficiency and scale efficiency. The results show that all of the firms included in the study attained the 86% pure technical efficiency. The scale efficiency of the industry reduced to 80% which made the understudy firms 31% technically inefficient. The pure technical efficiency is also high as compared to the scale efficiency for *takaful* and insurance firms separately.

4.4 Measurement of Productivity

This section elaborates the factor productivity results calculated by Malmquist Productivity Index (MPI), represented by Total Factor productivity (TFP) index, for insurance and *takaful* sector of Pakistan. This TFP change is putrid into Technical Efficiency Change Index (TECI) and Technology Change Index (TCI) to evaluate the reason for the change in TFP index. Afterwards Technical Efficiency Change Index (TECI) is further decomposed in Pure Efficiency Change Index (PECI) and Scale Efficiency Change Index (SECI) to measure the reasons of change in TECI.

Table 4.9 Table 4.9 presents the changes in the Malmquist-based Total Factor Productivity Index, 2008 is used as a base year and factor productivity is calculated from 2009 to onwards. In 2009, conventional insurance companies faced the 3% decrease in productivity whereas *Takaful* companies enjoyed tremendous increase of 83% in productivity. This increase of the productivity was due to the Dawood *Takaful* which was established in 2008 and its index of TFP approaches to 3.92 in 2009 as compare to 2008. Insurance companies succeeded to attain only 2% and 3% increase in 2010 and 2011 whereas after successful start in 2008, *takaful* concept was well appreciated by the market and *takaful* companies secured 10% and 21% increase in the factor productivity during the respective years. Insurance industry could not be able to maintain the increasing trend and observed declining trend in their factor productivity, i.e. 1%, 4% and 4% respectively, on the other hand comparatively *takaful* industry was continued to maintain improvement in productivity for 2012 and 2013. However, in 2014 and 2015, there was a decline in *takaful* industry of 13% and 7% respectively but the industry again observed 2 % increase in the productivity index. This decline in the *takaful* industry because the government allowed the conventional insurance companies to open the *takaful* windows. This step may increase some uncertainty factor among the *takaful* operators.

Table 4.9
Malmquist TFP change over period of 2008 to 2016

Company Name	2009	2010	2011	2012	2013	2014	2015	2016
Adamjee Insurance Co. Ltd.	0.88	1.06	0.79	1.08	1.12	1.21	1.04	1.13
Alfalah Insurance Co. Ltd.	0.90	0.89	1.00	0.86	0.88	0.83	1.00	1.03
Asia Insurance Co. Ltd.	0.83	1.05	0.85	0.93	0.64	0.71	0.71	0.68
Askari insurance	0.97	1.12	0.71	0.98	0.87	0.84	1.05	0.95
Atlas insurance	0.94	1.17	1.05	1.46	0.76	0.97	1.07	1.00
EFU-General insurance	1.01	0.95	1.12	1.01	1.07	0.97	1.02	1.16
EFU-Life insurance	0.94	1.00	1.05	1.00	0.96	1.12	1.35	0.67
Habib insurance	1.08	1.04	0.99	0.95	1.01	0.90	0.95	0.93
IGI insurance	1.10	0.95	1.23	0.76	0.88	1.07	1.07	1.00
Jubilee Life Insurance	1.02	0.79	1.18	1.17	1.07	0.91	1.09	0.97
New Jubilee insurance	1.01	0.93	1.10	1.10	0.95	0.93	0.99	0.96
Premier insurance	1.04	1.07	1.50	0.68	0.85	1.04	0.99	0.58
Shaheen insurance	0.92	0.97	0.81	0.91	1.40	0.93	0.91	0.98
State life insurance	1.01	1.25	1.10	0.92	0.96	0.96	0.96	1.06
Mean Conventional	0.97	1.02	1.03	0.99	0.96	0.96	1.01	0.94
***Takaful* Companies**								
Dawood *Takaful.*	3.92	1.07	1.19	1.07	1.08	0.59	1.09	1.08
Pak-Qatar (Family)	1.28	1.43	1.39	1.30	1.16	0.99	0.96	0.87
Pak-Qatar (General)	0.93	0.90	1.15	0.95	0.89	0.90	0.86	1.19
Takaful Pak	1.19	0.98	1.10	0.99	0.87	1.00	0.80	0.95
Mean *Takaful*	1.83	1.10	1.21	1.08	1.00	0.87	0.93	1.02
Mean Overall	1.16	1.03	1.07	1.01	0.97	0.94	1.00	0.96

The improvement in productivity index of insurance firms was especially due to the three companies, i.e. Atlas insurance, Efu-General insurance and State Life Insurance. State life Insurance is the largest insurance company of the country and owned by the Government of Pakistan. Whereas Dawood *Takaful*, and Pak-Qatar secured increase

in average productivity which is 39% and 17% respectively. The insurance firms on average observed 2% decline in the productivity whereas *Takaful* firms enjoyed 13% increase in the productivity in the same period. The overall industry secured the 2% increase in the productivity.

Figure 4.5 explains the trend of Total Factor Productivity in the industry. It is observed from the figure that except 2014 and 2015, the *takaful* operators showed the better productivity than the conventional insurance firms. Although the *takaful* operators are new in the market yet they performed well in the study period with respect to their conventional counterpart. Every year they have shown improvement in teir productivity.

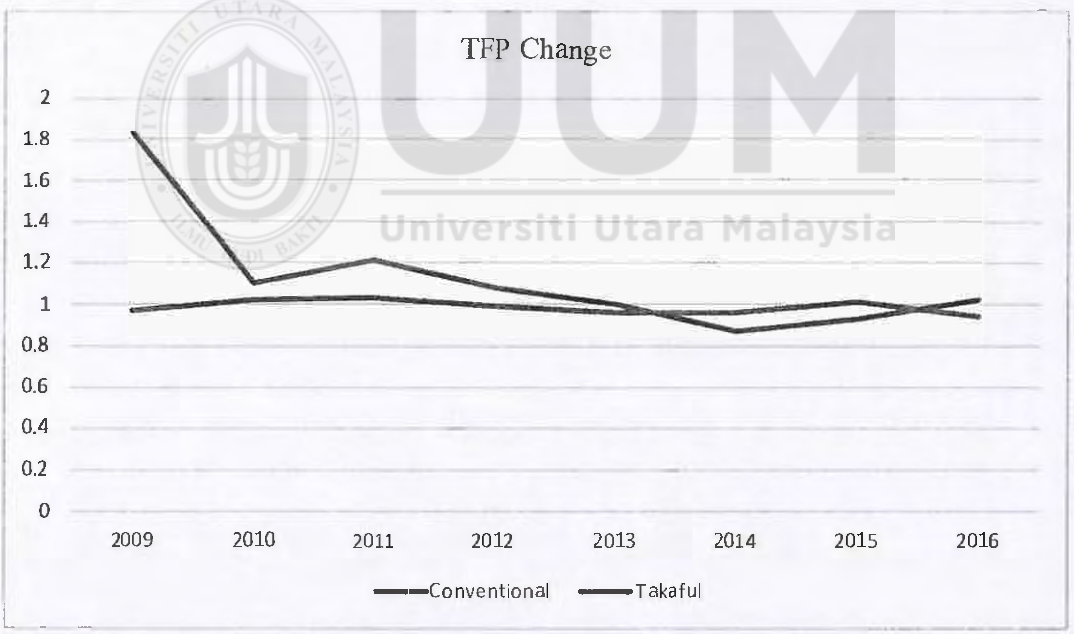


Figure 4.5
mean Malmquist TFP change

Total Factor Productivity (TFP) index is now decomposed into Technical Efficiency Change Index (TECI) and Technology Change Index (TCI). TECI shows the

contribution of change in technical efficiency change and TCI reflects that the factor productivity change is due to the change in technology.

Total Factor Productivity Index (TFPI) is now decomposed into two indexes, **i.e.** Technical Efficiency Change Index (TECI) and Technology Change Index (TCI). TECI shows the contribution of change in technical efficiency change and TCI reflects that the factor productivity change is due to the change in technology. Table 4.10 explains the Technical Efficiency Change Index (TECI) of the firms for the study period. These results explain that insurance industry faced the decline in technical efficiency by 4%, 8%, 22%, 17% and 5% respectively from 2009 to 2013. Insurance firms secured 1%, 13% and 4% increase in technical efficiency from 2014 to 2016. The most inefficient firms were Premier and New Jubilee Insurance and most efficient firms were State life and Shaheen insurance companies. However, *takaful* industry showed the mix trend in this index. These firms remained almost 2% and 3% declined in 2011 to 2014, were consistent in 2010 and 2015 and get increase in technical efficiency by 28% and 7% in 2009 and 2016 respectively and most efficient company amongst the *takaful* operator was Dawood *Takaful*. The overall technical efficiency of the industry was improved in 2009, 2015 and 2016. *Takaful* companies TECI improved by average of 3% whereas insurance company and overall industry TECI index decreased by 5% and 3% respectively for the study period. The decline in total factor productivity is due to the decrease in technical efficiency index are consistent with the results of Md Saad (2012)

Table 4.10
Technical Efficiency change index (TECI) of firms between time 2008-2016

	2009	2010	2011	2012	2013	2014	2015	2016
Insurance companies								
Adamjee Insurance Co. Ltd.	0.84	1.06	0.45	0.78	1.01	1.18	1.00	1.14
Alfalah Insurance Co. Ltd.	0.94	0.83	0.85	0.70	0.94	0.86	1.17	1.16
Asia Insurance Co. Ltd.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.71
Askari insurance	1.01	1.00	0.62	0.79	0.81	0.83	1.22	1.08
Atlas insurance	0.86	0.81	0.72	1.40	0.74	1.13	1.11	1.08
EFU-General insurance	0.96	1.00	0.63	0.74	0.97	0.96	1.06	1.46
EFU-Life insurance	1.00	1.00	0.91	0.72	0.77	1.03	1.39	0.73
Habib insurance	1.00	0.80	0.65	0.84	1.07	1.11	1.21	1.05
IGI insurance	0.97	0.69	0.74	0.63	0.88	1.19	1.28	1.15
Jubilee Life Insurance	1.00	0.92	1.01	0.83	0.86	0.84	1.13	1.11
New Jubilee insurance	1.00	0.98	0.62	0.80	0.86	0.90	0.95	1.18
Premier insurance	0.86	0.76	0.98	0.59	0.89	1.20	1.21	0.65
Shaheen insurance	1.00	1.00	0.74	0.81	1.50	0.97	1.15	1.00
State life insurance	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mean Conventional	0.96	0.92	0.78	0.83	0.95	1.01	1.13	1.04
***Takaful* companies**								
Dawood *Takaful*	2.09	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Pak-Qatar (Family)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Pak-Qatar (General)	1.00	1.00	0.94	0.87	0.91	0.88	1.00	1.30
*Takaful*Pak	1.05	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mean *Takaful*	1.28	1.00	0.98	0.97	0.98	0.97	1.00	1.07
Mean Overall	1.03	0.94	0.82	0.86	0.96	1	1.1	1.04

The Technological Change Index is explained in Table 4.11. The Technology Change Index was positive for conventional insurance companies till 2013 which was 2%, 13%, 37% 21% and 2% for the under-study period. However, the *takaful* industry improved its technology index, i.e. 30%, 10%, 23%, 11%, and 2% respectively from 2009 to 2013. Decline in technology change of 5%, 10% and 9% for 2014-2016 was recorded respectively for insurance industry. While *takaful* operators observed 6%, 10% and 8% from 2014 to 2016. Adamjee Insurance was most technological efficient amongst the Insurance companies whereas Pak-Qatar (Family) was most efficient amongst the *Takaful* companies. Average change in TCI index was almost same for the insurance and *takaful* firms for the under-study period.

Table 4.11
Technological Change Index (TCI) of firms for the period of 2008-2016

	2009	2010	2011	2012	2013	2014	2015	2016
Insurance companies								
Adamjee Insurance Co. Ltd.	1.05	1.00	1.77	1.38	1.11	1.03	1.04	0.99
Alfalah Insurance Co. Ltd.	0.96	1.07	1.19	1.23	0.94	0.97	0.85	0.89
Asia Insurance Co. Ltd.	0.83	1.05	0.85	0.93	0.64	0.71	0.71	0.96
Askari insurance	0.96	1.12	1.14	1.24	1.08	1.02	0.86	0.88
Atlas insurance	1.09	1.45	1.45	1.04	1.03	0.86	0.96	0.93
EFU-General insurance	1.05	0.95	1.77	1.38	1.11	1.01	0.96	0.80
EFU-Life insurance	0.94	1.00	1.15	1.40	1.24	1.08	0.97	0.91
Habib insurance	1.08	1.29	1.52	1.13	0.94	0.81	0.79	0.89
IGI insurance	1.13	1.38	1.66	1.21	1.00	0.91	0.84	0.87
Jubilee Life Insurance	1.02	0.86	1.17	1.41	1.24	1.08	0.96	0.87
New Jubilee insurance	1.01	0.95	1.77	1.38	1.11	1.03	1.04	0.82
Premier insurance	1.21	1.41	1.53	1.14	0.96	0.87	0.82	0.90
Shaheen insurance	0.92	0.97	1.10	1.13	0.93	0.96	0.79	0.98
State life insurance	1.01	1.25	1.10	0.92	0.96	0.96	0.96	1.06
Mean Conventional	1.02	1.13	1.37	1.21	1.02	0.95	0.90	0.91
***Takaful* companies**								
Dawood *Takaful.*	1.88	1.07	1.19	1.07	1.08	0.59	1.09	1.08
Pak-Qatar (Family)	1.28	1.43	1.39	1.30	1.16	0.99	0.96	0.87
Pak-Qatar (General)	0.93	0.91	1.23	1.09	0.98	1.02	0.86	0.92
Takaful Pak	1.13	0.98	1.10	0.99	0.87	1.00	0.80	0.95
Mean *Takaful*	1.30	1.10	1.23	1.11	1.02	0.90	0.93	0.95
Mean Overall	1.08	1.12	1.34	1.19	1.02	0.94	0.90	0.92

Table 4.9 explains the Total Factor Productivity (TFP) index which is the geometric mean of Technical Efficiency Change Index (TECI) and Technological Change Index (TCI) which is depicted in Table 4.10 and Table 4.11 respectively. Hence Technical Efficiency Change Index (TECI) is further decomposed in to Pure Efficiency Change Index (PECI) and Scale Efficiency Change Index (SECI). The results of Pure Efficiency Change Index (PECI) are given in Table 4.12. Pure Efficiency Change Index discusses the change in the productivity due to the efficiency of managerial staff and the efforts of human resources. The pure efficiency of the insurance companies was improved from 2013 to 2015, i.e. 1%, 2% and 6% respectively. Shaheen Insurance, IGI insurance and Askari insurance played a very significant role during the above-mentioned period whereas from 2009-2012 the insurance companies faced a declining trend in the pure efficiency index, i.e. 1%, 5%, 9% and 10% respectively and 6% decline in 2016. On the contrary, *takaful* companies improve their pure efficiency index by 5% and 8% in 2009 and 2016, remain unchanged in 2015 whereas declined by 1%, 2%, 3%, 2% and 3% respectively from 2010 to 2014.

Pak-Qatar (General) improved the index by 7% and 30% in 2009 and 2016 respectively whereas *Takaful* Pak remained consistent and unchanged in PECI for the under-study period. Insurance firms were 3% inefficient for the PECI index but *takaful* companies attained the consistent pure efficiency and remained unchanged for this period.

Table 4.12
Pure Technical Efficiency Change Index of firms between 2008-2016

	2009	2010	2011	2012	2013	2014	2015	2016
Insurance companies								
Adamjee Insurance Co. Ltd.	1.00	1.00	0.80	0.94	1.17	1.09	1.04	1.01
Alfalah Insurance Co. Ltd.	0.95	0.83	0.84	0.70	0.94	0.86	1.18	1.17
Asia Insurance Co. Ltd.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.71
Askari insurance	1.00	1.00	0.63	0.79	0.81	0.82	1.22	1.09
Atlas insurance	0.91	0.84	0.94	1.18	0.93	1.03	1.09	0.84
EFU-General insurance	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
EFU-Life insurance	1.00	1.00	1.00	1.00	0.89	1.12	1.00	0.94
Habib insurance	1.05	0.96	0.66	1.13	1.00	1.07	0.99	0.82
IGI insurance	1.00	1.00	1.00	0.64	1.06	1.43	1.03	1.00
Jubilee Life Insurance	1.00	0.97	1.03	1.00	1.00	1.00	1.00	1.00
New Jubilee insurance	1.00	1.00	1.00	0.98	0.81	0.82	0.89	0.83
Premier insurance	1.00	0.77	1.13	0.43	1.00	1.06	1.22	0.73
Shaheen insurance	1.00	1.00	0.75	0.81	1.51	0.95	1.15	1.00
State life insurance	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mean Conventional	0.99	0.95	0.91	0.90	1.01	1.02	1.06	0.94
***Takaful* companies**								
Dawood *Takafil.*	1.09	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Pak-Qatar (Family)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Pak-Qatar (General)	1.07	0.94	0.92	0.87	0.92	0.88	0.99	1.30
Takafil Pak	1.04	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mean *Takafil*	1.05	0.99	0.98	0.97	0.98	0.97	1.00	1.08
Mean Overall	1.01	0.96	0.93	0.91	1.00	1.01	1.04	0.97

Table 4.13 explains the Scale Efficiency Change Index (SECI). SECI defines the change in the efficiency due the adaptation of the firm with modern technology, liquidity, optimal level of capital, fulfill the requirement of new technology and IT etc. Insurance industry only improved its Scale Efficiency Change Index in 2015 and 2016 by 8% and 11% respectively. Although *takaful* operators are in their infancy stage which is also a major constraint in obtaining the scale efficiency but *takaful* operators improved their index by 22% and 1% in 2009 and 2010 respectively and have shown constant behavior for the rest of the period. On average, *Takaful* firms improved the SECI by 3% whereas insurance firms decline the index by 2% for the entire period of 2008 to 2016.

Table 4.13
Scale Efficiency Change Index of firms between 2008-2016

	2009	2010	2011	2012	2013	2014	2015	2016
Insurance companies								
Adamjee Insurance Co. Ltd.	0.84	1.06	0.56	0.84	0.87	1.08	0.96	1.12
Alfalah Insurance Co. Ltd.	0.99	1.00	1.01	1.00	1.00	1.00	1.00	0.99
Asia Insurance Co. Ltd.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Askari insurance	1.01	1.00	0.99	1.00	1.00	1.01	1.00	0.99
Atlas insurance	0.95	0.96	0.77	1.19	0.79	1.09	1.02	1.29
EFU-General insurance	0.96	1.00	0.63	0.74	0.97	0.96	1.06	1.46
EFU-Life insurance	1.00	1.00	0.91	0.72	0.87	0.92	1.39	0.78
Habib insurance	0.95	0.84	0.98	0.75	1.07	1.04	1.22	1.29
IGI insurance	0.97	0.69	0.74	0.98	0.83	0.83	1.24	1.15
Jubilee Life Insurance	1.00	0.95	0.97	0.83	0.86	0.84	1.13	1.11
New Jubilee insurance	1.00	0.98	0.62	0.81	1.07	1.09	1.07	1.43
Premier insurance	0.86	0.99	0.87	1.36	0.88	1.13	0.99	0.88
Shaheen insurance	1.00	1.00	0.99	1.00	0.99	1.01	1.01	1.00
State life insurance	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mean Conventional	0.97	0.96	0.86	0.94	0.94	1.00	1.08	1.11
***Takaful* companies**								
Dawood *Takaful*.	1.92	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Pak-Qatar (Family)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Pak-Qatar (General)	0.94	1.05	1.02	1.00	0.99	1.00	1.01	1.00
Takaful Pak	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mean *Takaful*	1.22	1.01	1.00	1.00	1.00	1.00	1.00	1.00
Mean Overall	1.02	0.97	0.89	0.96	0.95	1.00	1.06	1.08

4.5 Descriptive Statistics of Explanatory Variables

After computing the efficiency scores of the insurance and *takaful* firms using DEA approach and estimating the productivity and efficiency changes using MPI technique of the industry, the study regresses these efficiency scores on multiple explanatory variables.

This study applied Tobit regression technique for estimation of coefficients of variables using three different models of efficiencies including Technical Efficiency (TE), Pure Technical Efficiency (PTE) and Scale Efficiency (SE) as dependent variables. In first stage, DEA efficiencies are computed by using DEA linear programming efficiency model with three inputs (General & Administrative Expenses, Net Claims and Equity) and two outputs (Premium and Net Investment Income). Explanatory variables for the efficiency are SIZE (size), MS (Market Share), ROE (return on equity) and LEV (Leverage) in this study. Descriptive statistics of independent variables for insurance and *takaful* firms are elaborated in Table 4.14 and Table 4.15 respectively.

Table 4.14
descriptive statistics of Independent variables of insurance firms from 2008 to 2016

Variables	Mean	Median	S.D	Minimum	Maximum
Size	15.695	15.125	1.784	12.842	20.307
MS	0.056	0.011	0.088	0.000	0.380
ROE	0.052	0.140	0.452	-2.525	0.447
LEV	0.610	0.596	0.243	0.101	0.994

Variable size defines the value of asset size. Values of size are the log of asset of the insurance and *takaful* firms. Mean of the variable size is 15.695 for insurance firms and 13.893 for the *takaful* firms. Standard deviation for the insurance firms is 1.784 and

0.993 for the *takaful* firm. As mentioned, these values are the log of asset, the value represent that there is big variation between the assets of small firms and big firms. MS variable defines the market share of the insurance and *takaful* firms. Average of the MS variable for insurance firms is 0.056 and 0.006 for the *takaful* firms. ROE variable represents the return on asset. The mean value of ROE for insurance firm is 0.052 and -0.024 for *takaful* firms. The average value of variable LEV is 0.610 for insurance firms and 0.628 for *takaful* firms.

Table 4.15
descriptive statistics of independent variables for Takaful companies from 2008 to 2016

Variables	Mean	Median	Standard Deviation	Minimum	Maximum
Size	13.893	13.587	0.993	12.749	16.613
MS	0.006	0.003	0.008	0.000	0.028
ROE	-0.024	0.002	0.117	-0.317	0.158
LEV	0.628	0.646	0.227	0.043	0.952

4.6 Assumptions of Tobit Regression Analysis

The hypotheses are tested by using Tobit (or censored) regression analysis in the current study. The Tobit Model was first introduced by James Tobin in 1958. It estimates a linear regression model for a left-censored dependent variable. To avoid misleading results, before the model is accepted the regression diagnostic tests must be applied to verify the data's compatibility for the Tobit regression analysis. Several procedures are undertaken to assess the compatibility of the data with the following assumptions of the Tobit regression.

4.6.1 Model Specification

Model specification test examine the independent variables in the model. This model is conducted to examine the available independent variables in the model (Stock & Watson, 2015). It represents an error, if any irrelevant variable added into the model or any relevant variable is omitted from the model. In the case of any omitted variable, the error termis inflated. Table 4.16 shows the P-values of the variable 'hat' and 'hatsq'. P-value of 'hat' significant at 10%. P-value of 'hatsq' is not significant which shows that the model specified with the independent variable is specified correctly.

Table 4.16
model specification test

TE	Coefficient	**Std. Err.**	**P>|t|**
_hat	2.999042	1.767961	0.092*
_hatsq	-1.295871	1.139243	0.257
_cons	-0.7439769	0.6674435	0.267

Note: * significant at 10% level, ** significant at 5% level, *** significant at 1% level

4.6.2 Pearson correlation test

The Pearson correlation test is conducted to explore the correlations between the independent variables and to indicate the existence of multicollinearity. The Pearson correlation coefficients among the independent variables are presented in Table 4.17. According to Hair, Black, Babin, Anderson, and Tatham (2006), Cooper, Schindler, and Sun (2006) and Gujarati (2003), range value of the correlation for the independent variables is between +1 and−1 and this value is not a concern until it exceeds 0.8. These values suggest that multicollinearity is not a problem in the regression.

Table 4.17
correlation between independent variable

	Size	MS	ROE	LEV
Size	1	0.7956	0.3443	0.4496
		0.00***	0.00***	0.00***
MS	0.7956	1	0.227	0.5086
	0.00***		0.0037***	0.00***
ROE	0.3443	0.227	1	0.1579
	0.00***	0.0037***		0.0448**
LEV	0.4496	0.5086	0.1579	1
	0.00***	0.00***	0.0448**	

Notes: * significant at 10% level, ** significant at 5% level, *** significant at 1% level

4.6.3 Multicollinearity

Another way to check the multicollinearity is to look at the collinearity tolerance and the variance inflation factor (VIF) for all the variables in the regression model. Haslwanter (2016) suggests that if an independent variable has a collinearity tolerance more than 0.1 and VIF less than 10, a multicollinearity problem does not exist. The results in Table 4.18 indicate that all the collinearity tolerance values are above the value of 0.1, and all of the VIF values are below the value of 10. Therefore, multicollinearity is unlikely to affect the regression analysis.

Table 4.18
multicollinearity diagnostic test

	Collinearity Statistics	
Variable	**Tolerance**	VIF
Size	0.284786	3.51
MS	0.334261	2.99
ROE	0.868774	1.15
REV	0.6917	1.45

4.6.4 Normality Test

The Wald Chi-Square test statistic is the squared ratio of the Estimate to the Standard Error of the respective predictor. Table 4.19 explains the results of Wald Test for the Technical efficiency, Pure Technical Efficiency and Scale Efficiency to examine the validity of the models. In multivariate analysis this test is the fundamental assumption for multivariate analysis. The test calculates the degree of normal distribution of the sample data. This test in the context of regression is used to determine whether a certain predictor variable X is significant or not. Significant means that this variable add something in the model otherwise it should be deleted from the model in case of insignificance.

Table 4.19
Wald Chi-Square

	Technical Efficiency		Pure Technical Efficiency		Scale Efficiency	
	Insurance	*Takaful*	Insurance	*Takaful*	Insurance	*Takaful*
Wald chi2(5)	54.84	78.14	7.90	18.91	24.19	35.95
Prob> chi2	0.000***	0.000 ***	0.045**	0.018**	0.000***	0.000***

Note: * significant at 10% level, ** significant at 5% level, *** significant at 1% level

This model is good fit as the Wald test supports the level of significance of all explanatory variables in the model and the probability value represents that models are significant at 1% level.

4.6.5 Coefficient of Determination (R Squared)

First of all, the following section will test and explain the results of coefficient of determination (R Squared) test. These results are presented in Table 4.20. For Technical Efficiency model, the value of R^2 is 0.4825 for insurance and 0.6856 for *takaful* firms

which shows that these independent variables are bringing the 48.25% change for insurance sector and 68.56% for takaful firms simultaneously. The values of adjusted R^2 for Pure Efficiency model are 0.5107 and 0.7523 for insurance and *takaful* firms simultaneously. The values for Scale Efficiency model are 0.5445 and 0.6593 for insurance and *takaful* firms simultaneously. These values are above the moderate level and vale of F-test shows that model is good fit at the significant level of 1%.

Table 4.20
R squared values for Technical, Pure Technical and Scale efficiencies

	Technical Efficiency		Pure Technical Efficiency		Scale Efficiency	
	Insurance	*Takaful*	Insurance	*Takaful*	Insurance	*Takaful*
Number of obs	126	36	126	36	126	36
F(5, 156)	7.86	39.70	8.68	40.87	9.79	31.54
Prob> F	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
R-squared	0.5529	0.7085	0.5773	0.7619	0.6065	0.6874
Adj R-squared	0.4825	0.6856	0.5107	0.7523	0.5445	0.6593

4.7 Tobit Regression Results

After testing the model specification and multicollinearity of the variables and entire model, this section presents the Tobit regression results. In this regression model, three different models are used with technical efficiency, Pure Technical Efficiency and Scale efficiency (SE) as dependent variables.

The regression results explaining the relationship between efficiency and the explanatory variables i.e., size, market share, profitability and leverage are presented in this section. Three different kind of information are laid down in this table. P-Value will explain the significance of the relationship between the dependent and independent variables. T-value will also explain the significance and the acceptance of the

relationship between the dependent variable (DV) and Independent variable (IV). Value of the coefficient explains the strength of relation and the sign of the coefficient establishes the vector of relation between the dependent and independent variable.

The results of the regression model for technical efficiency and the independent variables are laid down in Table 4.21. The values of the variables size reflect that variable size will affect the technical efficiency by 0.1948. The direction for the relationship between technical efficiency and size is negative. It means that Asset Size will negatively affect the technical efficiency by 19.21%. The p-value for the variable is 0.000 which reflect that the relationship between the variable Asset Size and technical efficiency is significant at 1% confidence level. That β value for the variable MS is 2.5505 for the technical efficiency of the insurance firms. The variable MS has positively significant relation with the technical efficiency of the insurance firms at 5% confidence level. Although the variable ROE has -0.0752 of β value but the p-value for the variable is -0.173 which reflects that the relationship between variable ROE and technical efficiency is not significant for the insurance firms of Pakistan. Variable LEV has negative significant relation with the technical efficiency at 5% confidence level and the coefficient value the variable is -0.5969. The results depicted in Table 4.21 reflected that hypothesis (H1a, H3a, H5a) are accepted whereas the hypothesis H7a is rejected for the relationship of explanatory variables with technical efficiency of insurance sector in Pakistan context from 2008 to 2016.

Table 4.21
Tobit regression results for Technical efficiency of insurance firms from 2008 to 2016

	Coef.	St. Err	t-value	p-value
Size	-0.1948	0.0343	-5.67	0.000***
MS	2.5505	1.0002	2.55	0.012**
ROE	-0.0752	0.0493	-1.52	-0.173
LEV	-0.5969	0.2690	-2.22	0.029**

Note: * significant at 10% level, ** significant at 5% level, *** significant at 1% level

The results of the regression analysis for technical efficiency of the *takaful* operators of Pakistan are defined in Table 4.22. the results of the regression describe that variable size has positive relation with the technical efficiency of the *takaful* firms and the beta value is 0.3540. The p-value defines that the relation is significant at 1% confidence level. The variable has positive but insignificant relation with technical efficiency of *takaful* firms. The variable ROE is negatively associated with the technical efficiency of the *takaful* firms and coefficient value is -1.8722 and the p-value predict that the relationship is significant at 1% confidence level. The variable LEV is also negatively and significantly associated with technical efficiency of *takaful* firms at 5% confidence level. The results of the regression analysis for the *takaful* firms reflected that hypothesis (H2a, H6a, H8a) are accepted whereas hypothesis H4a is rejected for the technical efficiency of the *takaful* operators operating in Pakistan from 2008 to 2016.

Table 4.22
Tobit regression results for Technical efficiency of Takaful firms from 2008 to 2016

	Coef.	St. Err	t-value	p-value
Size	0.3540	0.0686	5.16	0.000***
MS	0.4919	6.866	0.07	0.943
ROE	-1.8722	0.3175	-5.90	0.000***
LEV	-0.4523	0.1834	-2.47	0.014**

Note: * significant at 10% level, ** significant at 5% level, *** significant at 1% level

The relation of the independent variables with the pure technical efficiency is being tested for the insurance firms of Pakistan and results are represented in Table 4.23. The results reflect that the variable size is negatively associated with pure technical efficiency of the insurance sector, but this relation is not significant. The variable MS is positively and significantly related to the pure technical efficiency of the insurance firms at 1% confidence level and the value of the beta is 1.6201. The variable ROE and LEV are negatively and significantly related to the pure technical efficiency at 5% confidence level and the coefficient value is -0.0743 and -0.3439 respectively. The results laid down in Table 4.23 represents that the hypothesis (H3b, H5b, H7b) are accepted whereas H1b is rejected between the pure technical efficiency and the explanatory variables size, MS, ROE and LEV for the insurance firms of Pakistan from 2008 to 2016.

Table 4.23
Tobit regression results for Pure Technical efficiency of Insurance firms from 2008 to 2016

	Coef.	St. Err	t-value	p-value
Size	-0.0258	0.0205	-1.26	0.210
MS	1.6201	0.4623	3.55	0.000***
ROE	-0.0743	0.0360	02.09	0.040**
LEV	-0.3439	0.1359	-2.56	0.012**

Note:* significant at 10% level,** significant at 5% level,*** significant at 1% level

The results for the relationship between independent variables and pure technical efficiency of the *takaful* firms is represented in Table 4.24. Variable size is negatively and significantly associated with the pure technical efficiency at 1% confidence level and the beta value is -0.1273. variable MS is significantly related to pure technical efficiency of the *takaful* firms. the relationship between the variables is positive and the beta value is 7.1648. the variable ROE is not significantly related to the pure technical efficiency of the *takaful* firms whereas LEV is negatively significantly related to the

pure technical efficiency of *takaful* at 1% confidence level and the coefficient value is -0.2463. The results for the hypothesis testing reflect that hypothesis (H2b, H4b, H8b) are accepted whereas hypothesis H6b is rejected for the *takaful* companies of Pakistan from 2008 to 2016.

Table 4.24
Tobit regression results for Pure Technical efficiency ofTakaful firms from 2008 to 2016

	Coef.	St. Err	t-value	p-value
Size	-0.1273	0.0263	-4.83	0.000 ***
MS	7.1648	2.4398	2.94	0.007 **
ROE	0.0536	0.0801	0.67	0.510
LEV	-0.2463	0.0582	-4.23	0.000 ***

Note: * significant at 10% level, ** significant at 5% level, *** significant at 1% level

Results for the independent variables with the scale efficiency of the insurance firms are shown in Table 4.25. The variable size is negatively related to scale efficiency of the insurance firms. its coefficient is -0.1031 and p-value represents that relation is negatively significant at 1% confidence level. The relation of MS is also significant for the scale efficiency of the insurance firms at 1% confidence level and the relation vector is positive. The coefficient of the variable is 2.4273. whereas it is evident from the table that ROE and LEV variable have insignificant relation with the scale efficiency of the insurance firms. The Table 4.25 shows the regression results for the scale efficiency of the insurance firms and these results reflects that the hypothesis (H1c,H3c) are accepted whereas hypothesis (H5c and H7c) are rejected for the relationship between the explanatory variables of the scale efficiency of the insurance sector of Pakistan.

Table 4.25
Tobit Regression results for Scale efficiency of insurance firms from 2008 to 2016

	Coef.	St. Err	t-value	p-value
Size	-0.1031	0.026	-5.66	0.000***
MS	2.4273	0.7590	2.63	0.000***
ROE	-0.0373	0.0372	0.79	0.324
LEV	-0.1657	0.2040	-1.13	0.290

Note: * significant at 10% level, ** significant at 5% level, *** significant at 1% level

Table 4.26 reflects the regression results for the scale efficiency of the *takaful* firms. The variable size has a significant positive relation with scale efficiency of *takaful* firms at 1% level of confidence and the coefficient is 0.3268. the variable MS has insignificant relation with scale efficiency for *takaful* firms. ROE is negatively significant related with scale efficiency of *takaful* firms at 1% confidence level and LEV is significant relation with scale efficiency of *takaful* firms at 5%. The relationship vector is negative, and coefficient is -04812. The hypothesis (H2c, H5c, H8c) are accepted whereas hypothesis H4c is rejected for the *takaful* operators of Pakistan.

Table 4.26
Tobit Regression results for Scale efficiency of Takaful firms from 2008 to 2016

	Coef.	St. Err	t-value	p-value
Size	0.3268	0.0647	4.76	0.000***
MS	2.8123	7.9186	0.36	0.722
ROE	-1.6068	0.1518	-3.26	0.000***
LEV	-0.4812	0.1518	-3.26	0.001**

Note: * significant at 10% level,** significant at 5% level,*** significant at 1% level

4.8 Summary Results of Hypothesis

The summary of the regression results between efficiency and the explanatory variables i.e., size, market share, profitability and leverage are presented in Table 4.27. This information will explain the relationship of the independent variable and dependent

variables. Three different models are run for technical efficiency, pure technical efficiency and scale efficiency. The results are compared for the hypothesis developed in chapter three. Three different kind of information are laid down in this table. P-Value explain the significance of the relationship between the dependent and independent variables. Value of the coefficient explains the strength of relation and the sign of the coefficient establishes the vector of relation between the dependent and independent variable and the decision is related to the acceptance and rejection of the hypothesis.

Table 4.27

summary results of the hypotheses

Hyp	Relationship	B-Value	P-Value	Decision
H1a	There is a significant relationship between Asset size and technical efficiency of insurance firms	-0.1948	0.000***	Supported
H1b	There is a significant relationship between Asset size and pure technical efficiency of insurance firms	-0.0258	0.210	Not Supported
H1c	There is a significant relationship between Asset size and scale efficiency of insurance firms	-0.1031	0.000***	Supported
H2a	There is a significant relationship between Asset size and technical efficiency of *Takaful* firms	0.3540	0.000***	Supported
H2b	There is a significant relationship between Asset size and pure technical efficiency of *Takaful* firms	-0.1273	0.000***	Supported
H2c	There is a significant relationship between Asset size and scale efficiency of *Takaful* firms	0.3268	0.000***	Supported
H3a	There is a significant relationship between Market Share and technical efficiency of insurance firms	2.5505	0.012**	Supported
H3b	There is a significant relationship between Market Share and pure technical efficiency of insurance firms	1.6201	0.000***	Supported
H3c	There is a significant relationship between Market Share and scale efficiency of insurance firms	2.4273	0.000***	Supported
H4a	There is a significant relationship between Market Share and technical efficiency of *Takaful* firms	0.4919	0.943	Not Supported
H4b	There is a significant relationship between Market Share and pure technical efficiency of *takaful* firms	7.1648	0.007***	Supported
H4c	There is a significant relationship between Market Share and scale efficiency of *takaful* firms	2.8123	0.722	Not Supported
H5a	There is a significant relationship between Profitability and technical efficiency of insurance firms	-0.0752	0.173	Not Supported
H5b	There is a significant relationship between Profitability and pure technical efficiency of insurance firms	-0.0743	0.040**	Supported

H5c	There is a significant relationship between Profitability and scale efficiency of insurance firms	-0.0373	0.324	Not Supported
H6a	There is a significant relationship between Profitability and technical efficiency of *takaful* firms	-1.8722	0.000***	Supported
H6b	There is a significant relationship between Profitability and pure technical efficiency of *takaful* firms	0.0536	0.510	Not Supported
H6c	There is a significant relationship between Profitability and scale efficiency of *takaful* firms	-1.6068	0.000***	Supported
H7a	There is a significant relationship between Leverage and technical efficiency of insurance firms	-0.5969	0.029**	Supported
H7b	There is a significant relationship between Leverage and pure technical efficiency of insurance firms	-0.3439	0.012**	Supported
H7c	There is a significant relationship between Leverage and scale efficiency of insurance firms	-0.1657	0.290	Not Supported
H8a	There is a significant relationship between Leverage and technical efficiency of *takaful* firms	-0.4523	0.014**	Supported
H8b	There is a significant relationship between Leverage and pure technical efficiency of *takaful* firms	-0.2463	0.000***	Supported
H8c	There is a significant relationship between Leverage and scale efficiency of *takaful* firms	-0.4812	0.001**	Supported

Notes: * significant at 10% level,** significant at 5% level,*** significant at 1% level

The relationship of dependent variables including technical efficiency, pure technical efficiency and scale efficiency of insurance and *takaful* sectors is discussed separately with the independent variable in the bellow sub-sections.

4.9 Discussion

The detailed discussion on the relationship of the variables Asset Size (SIZE), Market Share (MS), Profitability (ROE) and Leverage (LEV) with the dependent variable

Technical Efficiency (TE), Pure Technical Efficiency (PTE) and Scale Efficiency (SE) for insurance and takaful firms is made in detail and separately in next sub sections.

4.9.1 Relationship between Size and Efficiency (Technical Efficiency, Pure Technical Efficiency and Scale Efficiency)

This section presents the results between size and efficiencies (Technical Efficiency, Pure Technical Efficiency and Scale Efficiency) and compare the results between insurance and *takaful* firms. The regression is run for the insurance and *takaful* companies separately and the summary of the results for the acceptance and rejection are laid down in Table 4.27. The results of first regression for Technical Efficiency reflect that the variable size is negatively and significantly associated with technical efficiency and scale efficiency whereas size has no significant relation with pure technical efficiency of the insurance firms. Under these results, the hypothesis H1 a and H1 c is accepted at 1% confidence level whereas H1 b is rejected for the insurance sector of Pakistan from 2008 to 2016.

These results entail that the productive inefficiencies of the certain percentage of firms is likely due the inadequate size of the insurance firms. The descriptive statistics reflects that there is big difference between the size of insurance firms and the *takaful* firms. The mean value the Assets Size shown reflects that insurance firms are larger than *takaful* operators. The negative relation may be due to the fact that the small firms tends to surpass large firms due to little market segment with better market information and less agency hitch (Isik & Hassan, 2002; Jha et al., 2013). The results explain that insurance firms have failed to produce cheaper output, so size has negative relation with the efficiency of insurance firms. The negative association of the firm efficiency and

the size could be due to the fact that increase in size results in the supplementary cost and tendency of decreasing large firm's efficiency. Same results have been found by the previous studies including Darrat et al. (2002), Jha et al. (2013), Noreen and Ahmad (2016), Cummins and Zi (1998) in financial sector.

On the other hand, variable size has positive significant relation with the technical efficiency and scale efficiency of the *takaful* firms. *Takaful* industry have started its business approximately a decade before and comparatively has small size as compare to the established insurance firms. This significant result reflects that firms which have more asset size are efficient among the *takaful* operator. These results reflects that firms become larger are getting the more efficiency score are purely in accordance with the concept of the economies of scale arguments (Noor & Ahmad, 2012). These results reflect that as the size of *takaful* company in term of scale, branch network, use of technology increases, it will impact the scale efficiency positively. The studies including Mwangi and Murigu (2015), Wijesiri, Yaron, and Meoli (2017), Noor and Ahmad (2012), Ismail (2013), Ismail et al. (2013), Noor and Ahmad (2012) and Luhnen (2009) also support same results for financial sector.

Whereas the hypothesis H2b for the *takaful* firms, the relation between size and pure technical efficiency is negative and significant for the 1% confidence level. Agency theory address with the conflict of agency cost which creates an unpleasant environment in the firm. Managers and shareholders have opposite interest. Braendle (2017) define this phenomenon that in larger firms if management is not compensated, there is a chance of moral hazard and adverse selection according to agency theory. This result is also due to the unavailability of the required specialized management and human resource for the *takaful* firms different sharia-based structure from the insurance

firms. Studies including Darrat et al. (2002), Jha et al. (2013), Noreen and Ahmad (2016) also reported the negative relationship between size and scale efficiency for the financial sector.

4.9.2 Relationship between Market Share and Efficiency (Technical Efficiency, Pure Technical Efficiency and Scale Efficiency)

There are three hypotheses those are tested to determine the relationship between Market Share (MS) and Technical Efficiency, Pure Technical Efficiency and Scale Efficiency for the insurance firms and three hypotheses for the *takaful* firms.

The result for the insurance firms reflect that variable MS is positively and significantly related to the technical efficiency, pure technical efficiency and scale efficiency for the 1%, 5% and 1% confidence level simultaneously. These results reflect that firms with higher market shares are expected to get the benefit of cost sharing and they have to bear less per unit cost of the fixed expenses which leads to higher efficiency. These results are consistent with the previous studies including Ansah-Adu et al. (2011), Fenn et al. (2008).

Whereas variable market share is positively related to technical efficiency, pure technical efficiency and scale efficiency but this relation is only significant for pure technical efficiency. It means that market share has only significant relation with managerial efficiency of the *takaful* operators. Improved market share has positive impact on managerial efficiency. Agency theory addresses that when management is compensated and get some additional perks and bonuses to the agents which is known as agency cost, it effect the firm's overall performance and efficiency (Jensen & Meckling, 1976). *Takaful* firms with market share can be efficient because maintaining

the relationship with more customer can increase their efficiency. This result is according to the findings of the studies including Tregenna (2009) and Weiss and Choi (2008).

4.9.3 Relationship between Profitability (ROE) and Efficiency (Technical Efficiency, Pure Technical Efficiency and Scale Efficiency)

The hypothesis H5 of the study will determine the relationship of the variable ROE with the technical efficiency, pure technical efficiency and the scale efficiency of the insurance firms in Pakistan. The results given in the Table 4.27 designate that the profitability has negative relation with the efficiencies of the insurance sector, but this negative relation is significant for the technical and pure technical efficiency of the insurance firms. This means that the majority of insurers are negatively affected due to the technical factors rather than scale factors.

Whereas hypothesis 6 addresses the relationship of the profitability with technical efficiency, pure technical efficiency and scale efficiency of the *takaful* operators of Pakistan and the profitability is found to be negatively significant related with technical efficiency and scale efficiency, and profitability has non-significant relation with pure technical efficiency for the *takaful* firms. The results describe that the negative impact of the profitability on the efficiency in *takaful* operators is due to the scale of the *takaful* firms which suffer directly the scale efficiency and indirectly the technical efficiency of the *takaful* firms

The negative relation between the firm's efficiency and profitability may be due to the low level of competition in the insurance industry of Pakistan. Berger and Hannan (1998) describe the phenomenon of monopoly power in a market that monopolist earn

higher profit and without a competitive pressure, characterized by a higher level of inefficiency. El Moussawi and Obeid (2011) defined that firms with large profit have less incentive as compare to others to enhance the efficiency level. If the firm's profitability is negatively associated with the efficiency, it might mean, the economic environment in which firms are operating have more influence on efficiency as compare to profitability. In addition, the frail regulation and over-protection of firms could provide explanation for the weak association of efficiency with profitability. The negative relation between the firm's efficiency and profitability may be due to the low level of competition in the insurance/*takaful* industry of Pakistan. These finding are consistent with the previous studies including El Moussawi and Obeid (2011), Casu, Girardone, and Molyneux (2004) and Ataullah and Le (2006).

4.9.4 Relationship between Leverage (LEV) and Efficiency (Technical Efficiency, Pure Technical Efficiency and Scale Efficiency)

The regression results show that the credit risk measurement variable Leverage (LEV) has the negative relation with technical efficiency and pure technical efficiency of the insurance firms at 5% confidence level. but LEV is not significantly related to scale efficiency of the insurance sector of Pakistan.

The results of the hypothesis H6 addresses with the relationship of variable LEV with technical efficiency, pure technical efficiency and scale efficiency of the *takaful* firm operating in Pakistan from 2008 to 2016. Table 4.27 defines that LEV is negatively associated with technical efficiency of the *takaful* firms at 5% level of confidence. LEV has also negatively significant relation with pure technical efficiency and scale

efficiency at 1% and 5% level of confidence respectively for the *takaful* operators in Pakistan.

Financial leverage includes the amount of borrowing and liability relative to the amount of capital and assets (Kwan & Eisenbeis, 1997). The increased security level associated with higher equity capital holdings of insurance firms reflected in an increased volume of premiums because policyholder's value low levels of insolvency risk. Foong and Idris (2012) provide empirical support that the greater investments made possible from funds derived from higher sales of insurance products would not necessarily lead overall higher profitability for insurance companies. Uncontrolled sales of tariff-regulated insurance products could increase risks assumed and subsequent higher underwriting losses. In the insurance industry, higher leverage implies higher risks being assumed by the insurance firms, and if the firm's exposure in certain high-risk product segment becomes excessive, its performance could be adversely affected. These results are consistent with the previous studies including Alhassan et al. (2015), Eling and Luhnen (2010a), Luhnen (2009), Foong and Idris (2012) for the financial sector.

4.10 Summary

This chapter examines the technical, pure technical and scale efficiencies of Insurance industry of Pakistan by employing the two-stage method. In the first stage, the study uses the DEA approach to assess the efficiency level of insurance and *takaful* firms operating in Pakistan for the period of 2008 to 2016. The results indicate that both the insurance and *takaful* companies are facing the scale efficiency problem, which is also the reason for the technical inefficiency. The results describe that insurance firms performed well for scale efficiency as compare to the *takaful* operators which

contributes for the insurance firms to attain better technical efficiency. The reason for attaining the better scale efficiency may be that insurance firms were operating in the environment from a long period of time, they were well established and familiar with the environment as compared to the *takaful* operators which are at their infancy period. Whereas *takaful* operators achieved the better pure technical efficiency than the insurance firms. This difference may be due to the dedication and religious orientation of the management of *takaful* companies. The *takaful* operators were new in the business and were small in size. It is observed that the firms having small size enjoying the efficient management.

After estimating the efficiency, the study constructs the factor productivity index by applying the Malmquist Productivity Index (MPI). Total Factor Productivity Change Index reflects that insurance sector observed 2% decline in factor productivity whereas *takaful* operators secured the 13% increase in total factor productivity for the same period. Total Factor Productivity Index is decomposed into technical efficiency change and technological change. *Takaful* operators performed well as compared to insurance companies for both Technical Efficiency Change Index (TECI) and Technological Change Index (TCI). When Technical Efficiency Change Index (TECI) further decomposed into Pure Efficiency Change Index (PECI) and Scale Efficiency Change Index (SECI), it observed that *takaful* operators are more efficient as compared to insurance firms of Pakistan for this study.

In the second stage, Tobit regression model is used to regress the efficiency score obtained from the first stage on factors that could influence the efficiency score. The results suggest that technical efficiency, pure technical efficiency and scale efficiency of insurance firms and pure technical efficiency of *takaful* firms are negatively

associated with asset size of the insurance firms whereas asset size is positive related to technical and scale efficiency for the *takaful* operator. MS is positively significant related to efficiencies of insurance sector and pure technical efficiency of *takaful* sector but not significant related to technical and scale efficiency of the *takaful* sector. Profitability has negative relation with insurance sector, but this relation is only significant for pure technical efficiency of insurance firms. profitability is also significantly related to technical and scale efficiency of the *takaful* sector of Pakistan. LEV if significantly and negatively associated to efficiencies of insurance and *takaful* sector except the scale efficiency of insurance firms. The next chapter summarizes the dissertation, shows implication and limitation of the study, and presents some recommendations for future researches.

CHARTER FIVE

CONCLUSION AND RECOMENDATION

5.1 Conclusion

Efficiency, which is measured by the DEA, explain the stability, consistency and performance of the insurance sector. Producing the maximum output by utilizing the minimum inputs is the milestone for the existence of the financial firms like insurance and *takaful* sectors. The information regarding the current progress and the productivity trends are always an expedition for the management to forecast the stability of their organization. The infancy of the *takaful* sector in Pakistan market, competition with the well-established insurance sector and volatility of the economic factors exert the researchers to calculate the efficiency and productivity of the insurance and *takaful* industry in the developing country like Pakistan. Hence, this study examines the Technical Efficiency, Pure Technical Efficiency and the scale efficiency of the insurance and the *takaful* sector of Pakistan in relation to the influence of specific factor which influence the efficiency of the industry. This chapter presents recapitulation of major findings of this study, research implications and recommendation for further study, based on the objectives of the study.

5.2 Summary of the Study

It is well-known phenomenon that financial funds are considered as the back bone of the economic growth of any economy like Pakistan. Insurance sector like the other financial institutions supply the financial funds required for the production activities in a country. Therefore, it fills the gap in between the demand and supply of the financial

funds. It is consensus among the policy makers and academicians that economic stability and growth of a country depends on the performance of its financial system. Keeping that in view it is necessary to develop the financial sector according to the requirement of the economy. Therefore, inefficient financial sector has adverse impact on the developing process of the economy. So, policy makers, experts, financial gurus and academicians are always trying to monitor and evaluate the performance of the financial sector and estimate its impact on the growth of the said economy.

However, in contrast to conventional insurance, *takaful* (Islamic insurance) provides alternate products and services known as *shari'ah* compliant, i.e. interest free, less *Gharar* , free from prohibited activities and free of gambling. *Takaful* operators concentrate on profit/loss sharing and asset based/baked business instead of fixed rate of return (interest). Shariah Boards ensure that the products offered by the *takaful* operators must be shariah compliant. They also ensure that these products are based on *Tabarru'* and ta'awun. Shariah Boards ensure that the mode of business should be according to the verdict of Islamic jurisprudence. *Takaful* industry is emerging and growing at a considerable pace in the Muslim countries as well as in the rest of the word. As it is mentioned above that in most of the Muslim countries like Pakistan both systems are functioning simultaneously, therefore, it is necessary to evaluate the performance of the insurance and *takaful* industry. Because it provides the guidelines to the investors and shareholders in their decision-making process. This study covers the following three major points.

I. To measure and compare the efficiency level of insurance/*takaful* firms operating in Pakistan from 2008 to 2016. Hence efficiency of financial institutions may be calculated by using frontier approach, i.e. parametric or non-

parametric methods. Data Envelopment Analysis (DEA), a non-parametric approach is the most popular non-parametric linear programming method of computing efficiency. It requires no assumptions about the production function and is equally suitable for small sample of data. Therefore, Data Envelopment Analysis (DEA) is used for the above-mentioned period. The variables used in DEA model are chosen based on the intermediation approach. Under the intermediation approach, equity, general & management expenses, claim expenses are treated as inputs and producing premium or contribution collected, net investment income are selected as outputs.

2. The next point is to investigate the change in total factor productivity level of insurance and *takaful* operators. Malmquist Productivity Index (MPI) approach based on extension of DEA approach in order to calculate any changes in total factor productivity (TFP), technology & technical change and Pure Efficiency & scale efficiency change of conventional insurers and *takaful* operators is applied.
3. The last point is to identify the factors, such as Size, Market Share, Profitability and Leverage which determine the efficiency level of insurance/*takaful* sector in Pakistan. To test the determinants of efficiency of insurance and *takaful* firms of Pakistan, three models of efficiency (TE, PTE and SE) will be tested against the determinants. Since the DEA technique produces efficiency scores which are bounded by 0 and 1, hence, it is appropriate to use a limited dependent variable approach, such as Tobit model to perform the multivariate analysis.

From the empirical findings, the current study extracts the following conclusion.

For the empirical analysis, the data set is derived from financial reports of insurance and *takaful* firms operating in Pakistan from 2008 to 2016. The importance in the specified period is that the *takaful* operation was first allowed in Pakistan in 2005. All of the *takaful* firms started their operation in Pakistan since 2007. Before 2008, the data for the *takaful* operators is rarely available. Although *takaful* business was in its infancy stage yet these firms are trying to compete with the well-established conventional insurance firms. The data for outputs including net premium, net investment income, input including equity, claims and general & administrative expenses is collected from the annual reports of the firms. Descriptive statistics of the outputs and inputs elaborate the trend of the insurance industry. There was a significant increase in the premium collected as compared to the claims and expenses. This trend reflected that the insurance sector in Pakistan is in the stage of expansion. This positive change was more significant and observable in *takaful* operators than to the insurance firms.

Moreover, previous studies used diversified methodologies for measuring the performance of the financial institutions. Ratio Analysis and Frontier Approach are two major methodologies used by these studies. Frontier Approach deals with efficiency measurement of institutions in comparison with best performance unit. Efficiency of financial institutions may be measured by using parametric or non-parametric methods. DEA is the most popular non-parametric linear programming method of computing efficiency. It requires no assumptions about the production function and is equally suitable for the size of small sample.

Results show that the average of technical efficiency (TE), pure technical efficiency (PTE) and scale efficiency (SE) for overall industry during the sample period is 68%, 87% and 77%, respectively. The results indicate that most companies of the entire

industry are facing scale efficiency problems. However, technical efficiency of *takaful* operators is less by 4% than insurance firms for the study period. *Takaful* operators are more efficient in terms of PTE than insurance sector whereas insurance companies are more efficient in terms of SE. The high score of PTE reflects that managerial efficiency of *takaful* companies is relatively higher than the conventional firms. These results of the efficiencies are in accordance with the previous studies including Janjua and Akmal (2015), Md Saad (2012), Hosen, Amalia, and Muhari (2016), Kumar and Gulati (2008), Borges, Nektarios, and Barros (2008) and Rao, Kashani, and Marie (2010). This is may be due to their small size, dedication of achieving the marketing goals, eagerness to compete with well-established insurance sector and religious orientation. The *takaful* operators are inefficient in SE which indicates that *takaful* firms may be consuming more input resources. Because *takaful* operators are new in the market which may increase the fixed cost of the new establishments. Furthermore, may be because of their unique structure, limitations to invest in the limited portfolios approved by the sharia boards and in accordance with the rules of Islamic jurisprudence. Overall results of the efficiency reflect that declined in technical efficiency is due to the scale inefficiency of the industry. Most of the firms (including insurance and *takaful*) are operating with decreasing return to scale. These firms are unable to convert their inputs into the outputs efficiently. These firms should have to balance between risk, growth and profitability. These considerations could entail the operational decisions and business strategy related to product design, operational channeling and price effectiveness.

Malmquist Total Factor Productivity Indexes for the entire insurance and *takaful* industry was 1.02. It is observed that during the study period the productivity has been increased in the insurance industry. Whereas the total factor productivity (TFP) is found

to be higher in the *takaful* firms and there is positive productivity change in the *takaful* companies. *Takaful* companies observed 13% productivity increase on average whereas the insurance firms observed 2% decline during the same period (2008-2016). TFP Malmquist index decomposed into Efficiency Change Index and Technology Change Index. This sub-division indicated that technological change index for insurance and *takaful* operators achieved the same productivity change score, i.e. 1.06 and 1.07 respectively. It is astonished to know that both of these firms with the diverse foundations achieved the same scores, it may be due to the equal market environment and opportunities. Efficiency change index (ECI) declined by 5% for the insurance firms whereas *takaful* industry achieved the 3% productivity improvement. This is a good sign for the *takaful* operators and may attract its investors/shareholders. These results are in accordance with the previous studies including Saad et al. (2006), Faruk and Rahaman (2015) and Noreen and Ahmad (2016)

Efficiency change index is further segregated into pure efficiency change index (PECI) and scale efficiency change index (SECI) to find out the exact reason for change in productivity index. Insurance companies declined 3% in pure efficiency change index (PECI) whereas *takaful* firms remain unchanged for the entire period. Managerial contribution of the *takaful* operators was up to the mark whereas human efforts and managerial inputs for the insurance sector was declining from 2008 to 2016. In SECI, *takaful* firms once again performed well. As *takaful* operators started business in Pakistan since 2007 and they were in their infancy period, inefficient within their available resources, market share, size, use of technology and limited clientage etc. However, the *takaful* operators improved their scale efficiency change index (SECI) with the passage of time through learning by doing. The productivity can also be

improved by expanded products, advanced technology and competitive market environment.

Tobit regression is used to explore the determinants of efficiency. Three different models are applied to measure the impact of these key factors on already estimated efficiencies, i.e. technical efficiency, pure technical efficiency and scale efficiency of the firms for insurance and *takaful* industry separately. The results depicted that variable size has negatively significant relation with technical efficiency and scale efficiency of the insurance industry and variable size is positively and significantly related to technical and scale efficiency of the *takaful* industry whereas variable size is negatively and significantly related to pure technical efficiency. These results are different in nature and connotation. The negative relation between technical and scale efficiency entails the productive inefficiencies of the certain percentage of firms is likely due the inadequate size. The negative association of the firm efficiency and the size may be due to the fact that increase in size results in the supplementary cost and tendency of decreasing large firm's efficiency. In addition, because of their scale of operations which is small in a well-targeted market segment, small firms can be more effectively managed than their large counterparts. Fama and Jensen (1983a) explained this relation in such a way that enhanced business complexity could make monitoring managerial behavior more difficult and less effective in large entities than in small companies. These finding support earlier studies including Noreen and Ahmad (2016), Rahman (2015), Fenn et al. (2008) Cummins and Zi (1998) for insurance sector and Hermalin and Wallace (1994), Isik and Hassan (2002) for banking sectors. On the contrary, for the *takaful* operators, the variable size is positively related to the technical and scale efficiencies. These results depict that the *takaful* operators are operating at

the increasing return to scale phenomenon. Large firms amongst the *takaful* operators are more efficient as compare to the small firms because scale, branch network, use of technology increases, it will impact the technical and scale efficiency positively whereas negative relation between pure technical efficiency and size support the agency theory assumption that uncompensated management of the larger firms can involve in moral hazards and adverse selection. The second reason for the relation is the unavailability of the required specialized management and human resource for the different *takaful* mechanism.

According to the estimations, market share has positive impact on the change in technical efficiency, pure technical efficiency and scale efficiency for the insurance sector. These results reflect that firms with higher market shares are expected to get the benefit of cost sharing and they have to bear less per unit cost of the fixed expenses which leads to higher efficiency. whereas the relationship is only significant for the pure technical efficiency of the *takaful* industry. Agency theory addresses that when management is compensated and get some additional perks and bonuses to the agents which is known as agency cost, it effect the firm's overall performance and efficiency (Jensen & Meckling, 1976). These results are consistent with the previous studies including Ansah-Adu et al. (2011) and Fenn et al. (2008).

Firm's profitability (ROE) is negative related to the pure technical efficiency of the insurance sector whereas profitability is negatively related to the technical and scale efficiency of the *takaful* sector. The frail regulation and over-protection of firms could provide explanation for the weak association of efficiency with profitability. The negative relation between the firm's efficiency and profitability may be due to the low level

of competition in the insurance industry of Pakistan. These finding are consistent with the previous studies including Casu et al. (2004) and Ataullah and Le (2006).

The coefficient of leverage has negative association with efficiencies of insurance and *takaful* industry except the scale efficiency of the insurance sector is not significantly related to the leverage. In the insurance/*takaful* industry, higher leverage implies higher risks being assumed by the insurance firms, and if the firm's exposure in certain high-risk product segment becomes excessive, its performance could be adversely affected. These results are consistent with the previous studies including Alhassan et al. (2015), Eling and Luhnen (2010a), Luhnen (2009), Foong and Idris (2012) for the financial sector.

5.3 Contribution of the study

This study contributes to the body of knowledge in the following ways:

5.3.1 New Findings

This study extends the contributions of previous studies on measurement of efficiency which is currently scarce. The extension of knowledge is within the scope of conventional insurance and *takaful* firms of Pakistan covering a more recent study period of 2008 to 2016.

Contrary to the previous studies that argued that insurance companies are more efficient as compare to the *takaful* firms (i.e. Abduh et al. (2012); Md Saad (2012); Singh and Zahran (2013)), this study finds that *takaful* operators are more efficient than insurance firms. Although, *takaful* firms were a little inefficient from the insurance firms for few

years in the beginning of the study period because of their infancy, but these *takaful* firms are proved more technical efficient in the later year of study. The technical efficiency is decomposed into pure technical efficiency and scale efficiency. The both insurance and *takaful* firm attain more pure technical efficiency score and inefficiency of both insurance and *takaful* firms is found due to the scale efficiency.

The second new contribution is the measurement of factor productivity change. For the first time in Pakistan *takaful* literature, the reasons for the change in factor productivity are strained to investigate. The comparison between the change in factor productivity of insurance and *takaful* industry is made. It is found for the study period that *takaful* operators factor productivity improved than of insurance sector. It is also found that technological productivity contributes more for the total factor productivity than of technical productivity. Afterwards technical productivity index is decomposed into the pure technical change index and scale efficiency change index. The scale efficiency change is better than of pure technical efficiency index for both insurance and *takaful* firms for the period of 2008 to 2016. These findings are in accordance with the studies of Lee et al. (2018) and Saad et al. (2006)

Moreover, the study has taken key factors to determine the effect of these factors on efficiency of the insurance and *takaful* industry. The mixed results between insurance and *takaful* firms is another new contribution. For insurance firms, asset size is negatively associated to the technical and scale efficiencies, which entails that the productive inefficiencies of the certain percentage of firms is likely due the inadequate size of the insurance firms. Insurance sector is operating in Pakistan sine seventy years and these firms have big size and this size is negatively affecting the efficiency of insurance sector. Whereas technical and scale efficiencies of the *takaful* firms are

positively influenced by the size of the *takaful* firm. *Takaful* firms have started business in 2007 and are smaller in size. As the firm grow its asset size, its technical and scale efficiency improve in accordance with the economies of scale concept. As compare to the insurance sector, *takaful* firms only pure technical efficiency is improved by the large market share. Technical efficiency and scale efficiency are not significantly related to the market share of *takaful* operators for the study period. The finding depicts that most insurers are negatively affected due to the technical factors rather than scale factors whereas the negative impact of the profitability on the efficiency in *takaful* operators is due to the scale of the *takaful* firms.

5.3.2 Theoretical Contribution

The theoretical contribution of study is drawn from reviews of the previous literature and empirical findings. Most of the previous studies have addressed the problem of inefficiency of the financial institutions like insurance industry is due to the adverse selection and moral hazards. Agency Theory problems for insurance industry based in U.S, Europe and other developed countries. These countries have different economic, environmental and cultural characteristics than developing countries. Thus, the study has extended the understanding of Agency Theory in a developing country for the financial sector, especially for insurance/*takaful* industry of Pakistan.

The study also extends the understanding of Agency Theory in relation to the firm-level attributes including size, market share and profitability. Furthermore, in accordance to the theory that the variable size addresses the conflict of agency cost which creates an unpleasant environment in the firm. Managers and shareholders have opposite interest. If management is not compensated, there is a chance of moral hazard and adverse

selection according to agency theory. The variable current study has empirically founded that there is a positive relation between variable market share and pure technical efficiency of the *takaful* operators. These results that companies with large market share can compensate the management and provide some additional perks and bonuses to the agents which is known as agency cost, it effects the firm's overall performance and efficiency. Thus, it further extends the understanding of Agency Theory and the importance of asst size and market share in the insurance and *takaful* sector of Pakistan.

This study also provides support to the application of firm's theory that a firm (in this case, Pakistan insurance/*takaful* firms) can reduce their quantity of input to produce fixed outputs or produce more outputs with a specified number of inputs to enhance their efficiency. This study split the technical efficiency into pure technical efficiency and scale efficiency to find the reason of the inefficiencies. *Takaful* operators, during expansion of their network and product range, are bearing extra cost for attaining the per unit output. This phenomenon is suffering their scale efficiency directly and technical efficiency indirectly. This study reveals that firms are trying to minimize costs and maximize profits for their survival and also improving their productivity change index by improving their scale index which is also a fresh finding in understanding of Firm's Theory in context of *takaful* industry of Pakistan.

5.4 Implications of the Study

The main objective of this study is to evaluate the efficiency of the Insurance industry, it is assumed that the findings of the current study may be helpful in providing the

guidelines to its stakeholders, i.e. policy makers, management, shareholders and clients. Some of the policy recommendations are presented here:

I. Insurance and *takaful* sector are lacking with their efficiencies to attain the level of economies of scale, which is a cause for concern, as it is likely to constrain the growth and development of the financial sector in Pakistan, and consequently the overall economy. Therefore, regulation and supervision should focus on improving the quality of existing activities, management, and the upgrading of staff. In the long run, this could help to improve their efficiency.

II. It is also observed that the scale efficiency of *takaful* is lower than the conventional insurance. Maybe they are not able to utilize the existing resources optimally, so it is required they should put more efforts to explore the new earning opportunities. For example, they should enhance their branch network to exploit economies of scale and increase the number of clientages. It is a well-known phenomenon that in Pakistan more than 69% of the population lives in the rural areas and the major share of its GDP depends on the productivity of agricultural sector. Keeping that in view, it is suggested that *Takaful* operators should open new avenues in the rural areas. And in this way, they are able to exploit diversification and economies of scope. However, the results of this study further suggests that the Security exchange Corporation of Pakistan shall consider the low scale efficiency of the *takaful* operators especially and design a policy to facilitate the *takaful* operators for enhancing their branch network, new products development and adaptation of latest techniques and technology.

III. The findings of Malmquist TFP index indicate that total factor productivity index (TFPI) does not present the stable trend, i.e. showing increasing trend from 2008 to 2014 whereas it is declining in 2015 and 2016. It is suggested that *Takaful* firms should adopt new technologies that may be helpful in shifting their production frontier and also diversify their services and products. Simultaneously they should improve their risk management and introduce state of the art risk covering products to provide their customers dynamic, secure and shariah compliant services.

IV. The study also examines the role of firm-level attributes in effecting insurance/*takaful* companies' efficiency. The mix results for insurance and *takaful* sector implies to take different action for each industry. Negative relation of efficiency with the asset size suggest that the management of the insurance firms should decrease their input cost for cheaper output and try to reduce their supplementary cost of being larger firm. Whereas positive relation of asset size with *takaful* operators indicate the management and policymakers to enhance their asset size, term of scale, branch network, use of technology which will increase their scale efficiency.

V. The negative relation between the firm's efficiency and profitability may be due to the low level of competition in the insurance industry of Pakistan. Berger and Hannan (I 998) describe the phenomenon of monopoly power in a market that monopolist earn higher profit and without a competitive pressure, characterized by a higher level of inefficiency. The authorities ought to reconsider their reform and measures and try to stimulate more in dealing with the objective of competition in the marketplace in order to achieve the desired efficiency in the financial sector of Pakistan. There is implication for the evidence that lack of

effective competition gives room for industry "inefficiency to continue and still remain in business. An important implication is that more policies which would promote competition are deemed very essential for the enhancement of firm's efficiency in Pakistan.

5.5 Limitations of Study

The study has several limitations that should be noted. First, this study has used two samples of data i.e. insurance firms and *takaful* firms, so the results of this study cannot be applied to other financial institutions of Pakistan such as banks, development financial institutions or any other non-deposit taking institutions.

Second, the study has taken data from 2008 to 2016 based on reported and audited annual reports of the banks. The data of *takaful* windows of insurance firms have not been taken since the commencement of operations of these *takaful* widows is in different years. Hence, the results of this study are confined to the analysis of the financial years between 2008 and 2016, for both insurance and *takaful* firms of Pakistan

5.6 Future Research

With regards to the current study, there are several suggestions for future directions or future research as highlighted below:

This study addresses the issue of performance analysis of insurance and *takaful* industry in Pakistan by applying Data Envelopment Approach (DEA), Malmquist Productivity Index (MPI) and regression methods. However, approaches like ratio analysis could not apply because of the time and length constraint of the current study. Future studies can

use ordinary least squares (OLS) method to calculate the performance of the insurance and *takaful* industry.

This study also has limitation of sample selection. This study compares the performance of insurance and *takaful* firms in Pakistan. Study period ranges from 2008 to 2016 only because of the commencement of *takaful* firms in Pakistan after 2006. Another limitation of this study is that it focuses only on insurance/*takaful* sector. Other financial institutions e.g. banks, mutual funds, investment companies etc. are not included in this study due to the out of the scope of this study. Moreover, some of these financial institutions are relatively new and don't have any standardized pattern of financial reporting. On the other hand, Insurance/*takaful* firms report their financial results on a standardized format prescribed by the State Bank of Pakistan (SBP) and Securities Exchange Corporation of Pakistan (SECP). Enough sample size in insurance and *takaful* firms and data are available for empirical analysis which is the requirement of this study.

The present study focuses on financial aspects of the performance and process of the insurance industry. So only concentration was to collect the financial data from the annual reports of the firms. the secondary data is used to calculate the efficiency of the insurance and *takaful* sector of Pakistan. The objective of the current study is not to discuss the religious and ideological aspects of the Islamic finance so the reader of this research can feel some thirst about this dimension. Although customer's and employee's satisfaction are key elements of the performance, however, because of the nature of the present study it is not possible to collect the primary data on this issue which may deviate the study from its main objective. Future studies can use a mixed

approach in which the empirical results can be further enhanced with information obtained from primary data and interviews with relevant authorities

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